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MANIFESTATION OF VAGUENESS IN LANGUAGE USE: TWO EXPERIMENTS

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ABSTRACT This paper reports two sets of experiments conducted to investigate the empirical validity of the common characterisations of linguistic vagueness in terms of Sorites-susceptibility and borderline-admissibility. The experimental findings indicate that one's tendency to apply a vague predicate vis-à-vis a series of transitional objects change starkly, thus disconfirming the relevance of the Sorites reasoning to the actual use of a vague predicate. Moreover, one's tendency to apply a vague predicate to a borderline object is systematically variable as a result of the controlled resemblance between the borderline object and clearly positive/negative instances of the predicate, hence confirming indeterminacy as an empirically tested source of vagueness.

1 INTRODUCTION

Generally speaking, a speaker is vague about her use of a predicate P, e.g. 'yellow' 'rich' 'bald', when (i) there are cases in which she is uncertain whether P applies, and (ii) she may be trapped into thinking that a minute difference between a pair of objects (actual or possible) in some respect(s) relevant to the use of P does not matter, so that she would apply P to both or neither of them.

For example, given 'the thoughts, experiences, and practices of the speakers of a language' (McGee & McLaughlin 1994: 214), a competent English speaker may be uncertain whether to describe the colour of a baby oak leaf as green or not-green. Moreover, the general thought that the acquisition (or loss) of one penny does not matter to an individuals' economic status may trap her into the following reasoning:

(1) A man with no penny is poor.
If a man with no penny is poor, a man with one penny is poor.
If a man with one penny is poor, a man with two pennies is poor.
...

If a man with 9999999999 is poor, a man with 10000000000 pennies is poor.

Therefore, a man with 10000000000 pennies is poor.

Instances like (1) are known as the Sorites Paradox, whereas the colour of the baby leaf constitutes a borderline case for the application of 'green' with respect to oak leaves.

More generally, the application of a predicate is characterised as vague if it admits of borderline cases (henceforth borderline-admissibility) and is susceptible to the Sorites reasoning (henceforth Sorites-susceptibility). The aim of the current paper is to investigate how robustly these two standard characterisations of vagueness manifest in the actual uses of vague predicates in ordinary categorisational tasks. The central claim is that Sorites-susceptibility fails to be a robust phenomenon in language use whereas borderline-admissibility manifests robustly as pragmatic variability in the categorisation of borderline cases.

The structure of this paper goes as follows. Section 2 spells out the rationale of the experiments in connection with the conceptual sources of borderline-admissibility and Sorites-susceptibility that have been proposed in the literature. Section 3 advances two sets of hypotheses to be tested in the experiments: the former relates to the potential effect of one's tolerance to minute difference on the use of a vague predicate with respect to a series of objects which transition smoothly from clearly positive cases to clearly negative ones (henceforth a transitional series); the latter concerns the potential effect of the salient resemblance between clear and borderline cases in context on the use of vague predicates. Section 4 discusses two other factors that might influence the categorisation judgements to be elicited in the experiments, namely contextual calibration and typicality effect.

Taking these factors into account, section 5 reports the first experiment conducted to test the potential effect of tolerance. The major finding therein is that contrary to the expected, minute difference in-between objects in a transitional series did not lead to relatively uniform application of P. To the contrary, the participants terminated the application of P around the borderline area in a transitional series, but there was inter-subjective variance in exactly where to stop. The second experiment, recounted in section 6, investigates the potential effect of resemblance bias. It is found that a borderline item has elicited diverging categorisation responses, depending on the relative resemblance between it and clearly positive/negative items in a series. Section 7 concludes.

2 Rationale

2.1 Tolerance and Sorites-susceptibility

In the seminal paper 'On the Coherence of Vague Predicates', Crispin Wright (1975) submitted that the source of Sorites-susceptibility lies in one's *tolerance to minute difference* in the application of a vague predicate (henceforth Tolerance for short). That is,

(2) **Tolerance:**
If two objects a and b differ by barely distinguishable magnitude in the respects relevant to the application of P, P applies to a iff P applies to b.

Given a transitional series, the observance to Tolerance would force one to apply P uniformly to any pair of adjacent objects with minute difference in-between, thus being trapped into the Sorites reasoning.

On the basis of (2), Wright concluded that the use of a vague predicate is *incoherent* (see also Dummett 1975, Horgan 1994). To illustrate, imagine a transitional series from clearly green patches to clearly yellow ones. On the one hand, by observing the convention in English, one shall definitely apply 'green' to the first few patches, and definitely withhold from applying 'green' to the last few patches. On the other hand, by observing Tolerance, one shall apply 'green' uniformly to each pair of adjacent patches so that 'green' would end up being applied all the way to last patch. Hence, if one adheres to both the convention and Tolerance, which appears irreproachable, one ends up both applying and withholding from applying 'green' to the last few patches, which is incoherent. To avoid the incoherency, one has to stop following the convention or adhering to Tolerance. Since Tolerance leads to an across-the-board application of P, it is more plausible to give up Tolerance, despite its intuitive plausibility. However, according to Wright (1975), adherence to Tolerance is inevitable, and hence one must swallow the incoherency (cf. Wright 2001). His main argument for Tolerance was roughly as follows:

(3) a. *Tolerance Premise 1* (henceforth TP1):
The application of a predicate is determined only by casual observation.

b. *Tolerance Premise 2* (henceforth TP2):
Casual observation is constrained by one's perceptual limitations, which means that minute difference would go unnoticed.

c. *Tolerance Conclusion* (henceforth TC):
The application of the predicate shall not discriminate between a pair of objects with minute difference in-between.

Predicates that satisfy TP1 are known as observational predicates. Typical examples are colour terms such as 'green' or 'dark', and size terms such as 'long' or 'big'.

The main line of argument for TP1 is pragmatic: the utility of an observational predicate would be seriously damaged if its application were not based solely on casual observation. For instance, if one could not decide on the application of 'green' to an oak leaf by just looking at it, but had to establish first whether its colour is more similar to that of a mature oak leaf than to that of a russet one (or vice versa), much of our 'green' talk would involve far more contemplation than it in fact does. Provided that one could decide on the application of 'green' to an object by merely looking at it (i.e. TP1), *ceteris paribus*, one could decide on the application of 'green' to a pair of objects by merely looking at them. Crucially, if they look almost identical (i.e. TP2), they should receive the same verdict with respect to the application of 'green' (i.e. TC).

However, Wright's argument for Tolerance, as summarised in (3), could be flawed on at least two grounds.

Loophole No.1: the utility of an observational predicate would *come to nothing* if one adhered to Tolerance throughout a transitional series. For instance, if every patch in the colour spectrum ended up being described as green, the utility of 'green' as a conceptual device for categorising colours would be devastated. Hence, even if the utility of an observational predicate would be *seriously damaged* if its application were not based solely on casual observation, the utility of the predicate would be *wrecked* if its application observed Tolerance. On balance then, the pragmatic consideration for TP1 may not be strong enough to override the fundamental utility of predicates as categorisation devices (Horgan 1994). In other words, it may be posited that competent speakers would categorise objects in a transitional series in opposing terms, despite the minute difference in-between them.

Loophole No.2: TP1 does not hold for a borderline case. By definition, a borderline case such as a baby oak leaf is such that by looking at it, one could *not* determine whether a predicate such as 'green' applies to it. Thereby, it is not implausible to posit that one's adherence to Tolerance, if it were adhered to in the first instance, would break down in borderline cases.

In view of these two loopholes in the argument in (3), the aim of the first experiment (henceforth Experiment I) is to see whether or to what extent Tolerance is observed when competent English speakers are asked to categorise a transitional series of objects by means of a vague predicate. In a nutshell, the rationale of Experiment I is as follows:

(4) Provided that Sorites-susceptibility is induced by Tolerance, one should be more reluctant to change the verdict of P-application when the difference between a pair of adjacent objects in a transitional series is smaller. Conversely, if one is more willing to change the verdict of P-application when the difference between the pair is smaller, there would be no evidence for one's adherence to Tolerance, and hence no evidence for Sorites-susceptibility in the use of a vague predicate.

2.2 Indecision and borderline-admissibility

To start with, borderline-admissibility appears to be a hard case of indecision, for a competent speaker is not in a position to decide whether a vague predicate applies to a borderline object, even if she could be said to (i) have a good command of the relevant non-linguistic facts about the object at hand, and (ii) have a good grasp of how the predicate is applied to that kind of objects by others in the linguistic community, in relation to the particular interests/purposes of P-application in a particular context. In other words, it is such *pre-semantic* factors as "the thoughts, experiences, and practices of the speakers of a language" (McGee & McLaughlin 1994: 214) which fail to determine the application of P to a borderline object.

Conceptually, there are two common avenues to grasp the pre-semantic indecision. First, it may reflect a kind of *conceptual laziness*. That is, in defining the use of a predicate, its applicability is left *undefined* in borderline cases (Soames 1999, 2010). For instance, on account of conceptual laziness, the linguistic community would not exhibit a general tendency to regard 'green' or its opposite as an appropriate description of the colour of a baby oak leaf.

Second, the pre-semantic indecision may reflect a kind of conceptual flexibility. That is, in defining the use of a predicate, its applicability is left unspecified in borderline cases, so that a competent speaker is allowed to "go either way" (Sharpiro 2006: 10). For example, in virtue of conceptual flexibility, the linguistic community may be flexible about whether the colour of a baby oak leaf is to be described as green or otherwise.

The chief difference between conceptual laziness and conceptual flexibility is that the former is an attitude of omission whereas the latter is an attitude

of laissez-faire. When conceptual laziness prevails, the conventional attitude towards a borderline case would be such that competent speakers "typically do not ... take a view on ... [whether P applies to it]" (López de sa 2010: 329). Since the convention requires one to omit the matter, to form a verdict on the application of P to a borderline object would be to violate the convention. In comparison, when conceptual flexibility prevails, the conventional attitude towards a borderline case would be such that competent speakers are left to make up their own minds. Since the convention defers the matter to individual choices, one could form a positive or negative verdict on the application of P to a borderline object without violating the convention. Moreover, the individual's choice may be sensitive to what one perceives as the typical instances of P in a particular context (Raffman 1994, more on this below).

Thereby, adherence to conceptual laziness would lead one *not to apply* P to a borderline object, whereas adherence to conceptual flexibility would lead one *to apply* P or its complement to a borderline case *at will*. By contraposition, the way a competent speaker goes about the application of P to a borderline object may indicate whether conceptual laziness or conceptual flexibility actually prevails in the use of a vague predicate. In short, the rationale of Experiment II is that:

(5) Provided that borderline-admissibility is a case of pre-semantic indecision, if it is induced by conceptual laziness, a borderline object should be categorised similarly to an object to which P clearly does not apply, and receive an overwhelming amount of non-application verdicts. Conversely, if it is induced by conceptual flexibility, a borderline object should be categorised differently from a clearly negative object, and receive a similar amount of application and non-application verdicts.

In the next section, we cash out the rationales in (4) and (5) into concrete hypotheses to be tested in the experiments.

3 Hypotheses

Firstly, we assume that Tolerance is a gradual notion. That is, the degree to which one would tolerate the difference between a pair of objects in some respect relevant to the application of P is a function of the degree to which the objects differ in that respect.

To forestall an objection, it could be protested that Tolerance is a discrete notion. That is, there is a psychological limit to discriminability in casual observation, beyond which one is unable to discriminate, thereby being trapped

into the Sorites reasoning. However, it is important to remember that the force of the Sorites does not hinge on one's actual ability to discriminate. Even if one is allowed to use the most sophisticated machine to detect the difference between a pair of objects indiscriminable to the naked eye, one may still be trapped into the Sorites reasoning, for one may be reluctant, on the basis of the machine readings alone, to apply the predicate to one but not the other of the pair. In other words, what induces the paradoxical reasoning is not the indiscriminable difference *per se*, but the tendency to treat such difference as ignorable with respect to one's verdict on the application of P.

Based on Wright's argument for the inevitable adherence to Tolerance in (3), it is conjectured that:

(6) a. **Hypothesis I-a:**
Minute difference between adjacent objects in a transitional series would induce relatively uniform verdicts on the application of P to them.

b. **Hypothesis I-b:**
Greater difference between adjacent objects in a transitional series would induce less uniform verdicts on the application of P to them.

Simply put, the smaller the difference, the greater the Tolerance, and as hypothesised, the more uniform the application of an observational predicate.

Secondly, if conceptual flexibility, as opposed to conceptual laziness, dominates the application of a vague predicate to borderline objects, so that a competent speaker could go either way, we would expect that:

(7) **Hypothesis II-a:**
Given an ideal (i.e. maximally) borderline case, the general verdict of the application of P to it is about half application, half non-application.

Furthermore, if one is allowed to decide on the application of P to a borderline object on one's own term, one's decision may be biased by what one perceives to be the typical instances of P in a context, so that whether the borderline object (henceforth B for short) is judged as an instance of P may depend on how similar it is to the clear instances of P presented in a context. In other words:

(8) a. **Hypothesis II-b:**

If the resemblance between B and clearly positive instances of P is salient in a context, B is more likely to be judged as an instance of P in that context.

b. **Hypothesis II-c:**
When the resemblance between B and clearly negative instances of P is salient in a context, B is less likely to be judged as an instance of P in that context.

Before turning to the testing of the two sets of hypotheses in sections 5 and 6, in what follows we factor in three other effects which may influence the categorisation judgements elicited in the experiments.

4 Controlled factors

In order to test the effects of Tolerance and resemblance bias on categorisation, we control other factors that may affect categorisational judgements, namely *contextual calibration* and *typicality effect*.

To begin with, the application of a vague predicate, especially one in the adjectival form, is often confined to a specific class of comparison. For example, the range of colours that counts as red for shoes is probably redder than the range of colours which counts as red for hair. Such confinement is also known as contextual calibration in Kamp & Partee (1995). Crucially for our purpose, contextual calibration is orthogonal to vagueness in the application of a predicate. To wit, when one is considering the application of 'red' with respect to ink, what is so considered to be red may be vague: one could easily conceive of marginally red ink; and if the colour of two ink samples differ minutely, 'red' appears to apply to both or neither. Given that contextual calibration could be indicated by nominal phrases or inferred from context, in the experiments we controlled the effect of implicit contextual confinement by testing predicates in Adj+N constructions.

Moreover, it is possible that one's categorisational judgements are made in relation to the prototypical instances invoked in the use of a predicate (Rosch 1973). That is, whether P applies to an object newly encountered in a context may depend on the similarity between it and the prototypical instance(s) of the predicate that come to one's mind in that context. Such typicality effect may be particularly relevant for the application of an observational predicate, as a learner is likely to acquire the predicate by being introduced to its prototypical instances. For the learner, the most obvious strategy for deciding on its application in a novel case would be to compare it with the prototypical cases in the contextually relevant respects. In the presence of typicality effect, an

object will be judged as an instance of the predicate if it is sufficiently similar to the prototypical instances.

To compare, the effect of Tolerance would be that an object is judged as an instance of the predicate if it is sufficiently similar to another object which has been judged as an instance of the predicate. The effect of similarity bias would be that a borderline object is judged as an instance of the predicate if it is noticeably more similar to clearly positive instances than to clearly negative instances. Thus construed, typicality effect, if there is any, is *orthogonal* to Tolerance effect and *intrinsically related* to similarity-bias effect.

On the one hand, it is unlikely that typicality effect would impinge on Tolerance effect. For instance, the fact that some men are taken to be prototypical instances of 'bald' has little bearing on whether the difference of one strand of hair could change one's verdict on the application of 'bald'. *Mutatis mutandis*, even if the prototypical instances of 'bald' change gradually as one moves along a transitional series (Kamp 1981, Raffman 1994, Graff 2000), with respect to each set of prototypical instances arisen in each step, the question still remains whether the difference of one strand of hair would effect a change of verdict in the application of 'bald'.

On the other hand, typicality effect seems to subserve similarity-bias effect. For a predicate whose application exhibits typicality effect, the prototypical instances are usually clearly positive instances. Given that a borderline object *per se* resembles clearly positive instances to the same extent as it resembles clearly negative instances, no typicality effect could bias one's categorisation of a borderline object. Conversely, if the categorisation of a borderline object is to be biased by any typicality effect, it must be because the borderline object is presented as resembling clearly positive instances to a noticeably greater (or lesser) extent than resembling clearly negative instances. In other words, for the contextually-controlled similarity bias to induce different categorisation on a borderline object, (some mechanism akin to) typicality effect would be in force.

Nevertheless, insofar as the prototypical instances of a predicate may vary drastically among individuals, we tried to minimise such cross-individual variability by recruiting participants from the same age group (18-26) and educational/cultural backgrounds (undergraduates and graduates who are native English speakers).

5 Experiment I: Tolerance effect in language use

In this section we recount the procedures and results of Experiment I and discuss the implications of those results.

5.1 Participants

A randomly composed group of forty native English speakers from the University of Cambridge were asked to complete two versions (2×20) of an online questionnaire. Each participant received 3 GBP for participation.

5.2 Materials

A questionnaire consisted of a general instruction and eighteen categorisational tasks. The first six tasks were warm-ups. Participants were instructed to select, from a randomly arranged answer set, object(s) that satisfy a precise description. In the following twelve tasks, six controlled tasks with vague descriptions were interspersed with six filler tasks with precise descriptions. Participants were instructed to select, from a transitional series, object(s) that satisfy a vague or a precise description. The order of the objects was randomised so that the purpose of the experiment was not revealed to the participants.[1] (9) and (10) are examples of the specific instructions given at the start of each task, where (9) is an instruction for a tested task whereas (10) a filler:

(9) In this task you are invited to choose some WITHERED LEAF/LEAVES. Judging from your general experience, please choose from the following options the one(s) that you think are WITHERED. You may pick as MANY leaves as you like but please do NOT choose any more than you would like.

(10) In this task you are invited to choose some flower(s) each of which consists of MORE THAN FIVE petals. Please choose from the following options the one(s) that you think consist of MORE THAN FIVE petals. You may pick as MANY flowers as you like but please do NOT choose any more than you would like.

Participants were reminded to 'judge from their every-day experience' in the controlled tasks so as to minimise one's tendency to give application responses only on the basis of the range of objects presented. Table 1 lists the six controlled topics and the six filler topics used in the experiment, together with the ranges of objects used in the answer-sets. The first three controlled topics

1 To forestall an objection, it may be protested that the randomisation would make the answer-set look less like a transitional series. However, since the participants were given no time limit to make categorisational judgements, they were free to compare the similarities in-between the objects before giving their responses. After all, what matters in a transitional series is the perceived similarity in-between the objects.

involve predicates whose application is causally related to the colour appearances of the objects. For example, in normal circumstances, the greenness of a leaf is a reliable indication of the withering stage it is in. Assuming that such causal relations are commonsensical knowledge obvious to the participants, the use of these predicates enabled us to avoid mentioning the colour terms, while testing the effect of tolerance to minute difference in hue. The rationale here is that descriptions in colour terms may draw unnecessary attention to the colour of the objects, whereas indirect descriptions of the colour are more suitable for eliciting the participants' spot-on responses. The other three controlled topics involve predicates whose application relates directly to the shapes of the objects. In the questionnaire, the three controlled topics about the colours of the objects are interspersed with the three controlled topics about the shapes of the objects.

5.3 Manipulations

Each categorisation task consisted of an instruction and an answer-set. Only one task appeared on one page of the questionnaire. The set of multiple answers presented for a controlled task contained seven items: three items that are clearly instances of P, a borderline item, and three items that clearly are not instances of P. Each item differs from its adjacent members by an identical magnitude in hue or shape, so that the entire series approximates a smooth transition from clearly positive instances to clearly negative ones. Hue difference in-between the items was controlled by manipulating the hues of otherwise identical objects in Photoshop. Shape differences in-between the items were manipulated by cutting out, by equal time interval, segments from an incremental process taped as time-lapse videos on YouTube.

The controlled variable was the magnitude of difference in-between items (henceforth *mag*), in terms of hues or lengths of time intervals.[2] Two values of *mag*, namely five and ten, were set in the two versions of the questionnaire. For instance, in a 5-mag questionnaire, an answer-set contains seven items each of which differs from its adjacent members by five magnitudes. Table 2 illustrates the patterns in the answer sets, with examples used in the experiment (P stands for an item that clearly instantiates P; ¬P stands for an item that clearly not instantiates P; B stands for a borderline item. The numbers in the parentheses stand for the magnitude of difference between an item and the borderline one.

2 Objects were manipulated to differ along a single dimension. This is another artefact of the experiment, for the application of a predicate in actual scenarios often involves consideration along several dimensions. For instance, the verdict on someone's being a child may require considerations of her physical age, psychological development, personality, relationship to the speaker, etc. In the experiments, we chose to test observational predicates for whose application a single dimension is salient.

Topic types	Topics	Range of objects
Controlled (Vague descriptions)	Withered leaf	*Leaves in different stages of withering, from green to yellow*
	Ripe tomato	*Tomatoes in different stages of ripening, from red to orange*
	Dark chocolate	*Chocolates in different hues, from black to light brown*
	Blossomed rose	*Roses in different stages of blossoming, from buds to fully blossomed*
	Lush tree with a big shade	*Tree shades in different sizes, from small to large*
	Long table candle	*Red candles with different lengths, from short to long*
Filler (Precise descriptions)	Shirt with at least *n* blue/purple dot/star	*Shirts printed with different amounts of dots and stars in blue or purple*
	Flower with more/less than five petals	*Flowers with different amounts of petals, from one to nine*
	Chocolate bar with more/less than twelve pieces	*Chocolate bars composed of different amounts of pieces, from three to twenty-one*
	Bottle more/less than half full/empty	*Bottles filled with different amount of liquids*
	Numerical string with more/less than five odd/even numbers	*9-digit strings with different combinations of odd and even numbers*
	Collared/ collarless shirt	*Shirts with different styles in the collar*

Table 1 Vague and precise topics used in the experiments

Variable val.	Answer-set patterns
5-magnitude	In this task you are invited to choose some BLOSSOMED ROSES. *Judging from your general experience*, please choose from the following options the one(s) that you think are BLOSSOMED. You may pick as MANY roses as you like but please do NOT choose any more than you would like.  ¬P(15); ¬P (10); ¬P (5); B (0); P(5); P(10); P(15)
10-magnitude	In this task you are invited to choose some BLOSSOMED ROSE(S). *Judging from your general experience*, please choose from the following options the one(s) that you think are BLOSSOMED. You may pick as MANY roses as you like but please do NOT choose any more than you would like.  ¬P(30); ¬P (20); ¬P (10); B (0); P(10); P(20); P(30)

Table 2 Two types of answer-set patterns in Experiment I

For example, P(10) stands for an item that clearly instantiates P which differs from the borderline item by 10 magnitudes.):

In each version of the questionnaire we replicated the answer-set patterns in the filler tasks which were interspersed with the controlled tasks. For example, a controlled task with a 5-mag series of green-to-yellow leaves in the answer set was preceded by a filler task with a series of white shirts with a decreasing number of purple dots and an increasing numbers of blue dots in the answer set.

5.4 Results

For each item presented, a participant either ticked the box under it if she judged it to satisfy the relevant description, or else left the box un-ticked. Such a Hobson's choice (to tick it or to leave it) mirrors the Hobson's choice one has in using a predicate: to *apply* or to *withhold* (Wright 1975: 350). For a given item, one may withhold from applying P either because one is certain that P does not apply to it, or because one is uncertain if P applies to it. In the experiment, we did not distinguish between these two attitudes by giving the participant a third choice. The reason is that we were most interested in

seeing how a participant would *apply* P vis-à-vis a transitional series. Since the choice of application is on a par with the choice of non-application, the latter of which encompass the choice of applying-the-opposite and the choice of not-sure-what-to-apply, if a participant were given more than two choices, the additional one(s) would only serve to *distract* her from contemplating on whether P *applies*.

Importantly, from one's application or non-application (i.e. withholding from the application) of a predicate, no conclusion is to be drawn with regard to the correct logical model abided by the use of the predicate. That is, one's application of P vis-à-vis a transitional series could be interpreted in accordance with different logics for vagueness. In the context of classical bivalent logic, one's application of P would be seen as one's picking up items that instantiate P and leaving behind items that instantiates its opposite ¬P. In the context of supervaluationist logic (Fine 1975), one's application of P would be interpreted as one's selecting items which definitely instantiate P and leaving behind items which *definitely do not instantiate* P and items which *do not definitely* instantiate P or its opposite. In the context of many-valued logic (Zadeh 1967, Smith 2008), one's application of P would be taken as one's ticking items that instantiate P to a sufficiently high degree (the threshold of degree is to be determined pragmatically by the specific requirements of the task at hand, one's mood, etc.), and leaving behind items that do not instantiate P to the pragmatically-determined threshold of degree.

In other words, from the observations about one's application and non-application of P, it is not possible to deduce how many choices (two or three or infinitely many) one has contemplated for the application of P.[3] The underlying choices may be subtler than the manifested dichotomy between application and non-application. Be that as it may, the Hobson's choice offered for each item in the experiments does not presuppose that predicate application is a matter of contemplating only two choices, but respects the most basic and natural way predicates are used.

Altogether twenty responses (application or non-application) were collected for each item. We then calculated the percentage of application responses against total responses. The percentage stands for the general tendency of applying a particular predicate to that item. Tables 3-4 sum up the percentages of application found in the six controlled topics in the two trials (the numbers were rounded to hundredths).

3 As an attempt to test which logical model accords best with the non-application of a vague predicate, Alxatib & Pelletier (2011) reported a series of experiments to test the acceptability of negation and double negation on borderline propositions. The experiments therein elicited meta-linguistic judgements on simple and complex categorisation judgements in negative terms. To compare, the experiments reported here elicited simple categorisation judgements.

Topics / Items	¬P(30)	¬P(20)	¬P(10)	B	P(10)	P(20)	P(30)
Withered leaf	0%	0%	0%	35%	75%	75%	70%
Ripe tomato	0%	5%	0%	20%	50%	85%	100%
Dark chocolate	0%	5%	5%	15%	55%	90%	90%
Blossomed rose	0%	0%	10%	35%	80%	100%	100%
Tree with a big shade	0%	0%	15%	45%	100%	100%	100%
Long table candle	0%	0%	10%	25%	95%	95%	100%
Average	0%	1.67%	6.67%	29.17%	75.83%	90.83%	93.33%
Standard variation	0%	1.05%	2.47%	4.55%	8.31%	3.96%	4.94%

Table 3 Application responses on a 10-mag series

Moreover, we were most interested in the overall tendency of applying a vague predicate to an item in some *relative* position of a transitional series. (A relative position is defined over the magnitude of difference in-between items in the series, represented by such abstract labels as B, P(5), etc.). Hence, in Tables 3-4 we averaged out the percentages of application responses for each relative position across the six controlled topics. This enabled us to abstract away topical differences and obtain an idealised picture of the overall application responses to each relative position in the two types of transitional series. We then projected the parings of average percentages and relative positions in each type of transitional series onto a two-dimensional coordinate, and juxtaposed the two graphs in Figure 1.

5.5 Interpretation of the results

The above findings reveal two main trends in the application of a vague predicate vis-à-vis a transitional series.

First, the results did not show the posited effect of Tolerance, hence disconfirming the hypothesis that minute difference in-between the items would induce relatively uniform application responses to them.

Items / Topics	¬P(15)	¬P(10)	¬P(5)	B	P(5)	P(10)	P(15)
Withered leaf	0%	0%	1%	45%	75%	90%	90%
Ripe tomato	5%	5%	5%	20%	30%	80%	100%
Dark chocolate	0%	5%	0%	10%	75%	65%	90%
Blossomed rose	0%	0%	5%	30%	40%	100%	95%
Tree with a big shade	0%	20%	5%	40%	60%	95%	100%
Long table candle	0%	0%	5%	80%	85%	100%	95%
Average	0.83%	5%	5%	37.5%	60.83%	88.33%	95%
Standard variation	0.83%	3.16%	1.29%	9.98%	8.89%	5.58%	1.83%

Table 4 Application responses on a 5-mag series

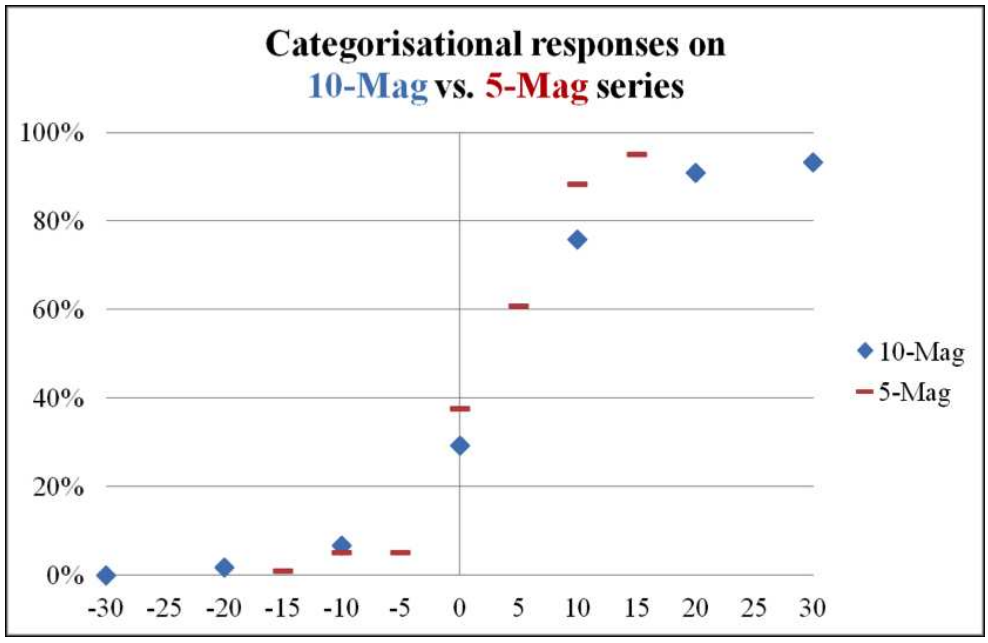

Figure 1 Application responses on 10-mag versus 5-mag series

More specifically, let us first look at the decrease of application responses in a 10-mag series. The first two clear items of P received similarly high application responses, i.e. 93.33% and 90.83%. Moving to the third item P(10), the application percentage dropped to 75.83%. In other words, *at most* 75.83% of the participants had based their categorisation judgements on the similarity in-between items, so that they applied P to P(10) as a result of having applied P to P(20). 'At most' because the participants may have applied P to P(10) for other reasons than adherence to Tolerance. For instance, they may have applied P simply by considering P(10) in isolation.[4] Moving to the borderline item, the application percentage dropped dramatically to 29.17%. That is, *at most* 29.17% of the participants had based their categorisation judgement on the similarity in-between items, so that they applied P to B as a result of having applied P to P(10). Therefore, it is safe to say that there was not much effect of Tolerance on one's categorisation of the borderline item. In other words, adherence to Tolerance appeared to break down in the borderline area (recall *Loophole No. 2* in §2.1).

Now when the difference in-between the items dropped to 5 magnitudes, the first two clear items of P still received similarly high application responses (95% and 88.33%). However, the percentage dropped quite a lot to 60.83% at the third clear item of P (i.e. P(5)). That is, *at most* 60.83% of the participants had based their categorisation judgements on the similarity in-between items, so that they applied P to P(5) as a result of having applied P to P(10). As compared to a 10-mag series, Tolerance appeared to die down 'earlier' in a 5-mag series, before we reached the borderline case. The percentage then dropped further to 37.5% at the borderline item. That is, *at most* 37.5% of the participants had based their categorisation judgements on the similarity in-between items, so that they applied P to B as a result of having applied P to P(5). In other words, when the difference in-between the items became smaller, adherence to Tolerance broke down earlier.

Crucially, if the smaller difference in-between the items in a 5-mag series were to induce more uniform application responses, as hypothesised in (6) (repeated below),

(11) a. **Hypothesis I-a:** Minute difference between adjacent objects in a transitional series would induce relatively uniform verdicts on the application of P to them.

4 This could be the case in the categorisation of a 5-mag series of dark chocolates. From the fourth line of Table 3.4, 5% of the participants ticked ¬P(10) as P but no one ticked ¬P(5). Similarly, 65% of the participants picked P(10) as P whereas 75% of the participants picked P(5). The invert increase of application responses might be due to the fact that the participants were considering each item in isolation, instead of comparing them with similar items in the series.

b. **Hypothesis I-b:** Greater difference between adjacent objects in a transitional series would induce less uniform verdicts on the application of P to them.

Tolerance should have broken down *later* in a 5-mag series than in a 10-mag series. That is, the majority of the participants should have continued applying P to P(5) and even B. Au contraire, only a small majority (60.83%) had continued applying P until P(5). Among those who did, again a small majority (around 61.6%, that is 37.5% of the total participants) had further continued applying P to B. In other words, the participants appeared to be cautious about extending P-application to B, even when the similarity in-between the items was increasingly small (more on this below).

On the whole, in both 10-mag and 5-mag series, there was a stark decrease of application responses around the borderline item. Regardless of the magnitude of difference in-between items, all three clear items of ¬P have received low application percentages (below 7%), and nearly all three clear items of P have received high application percentages (above 75%, with the exception of the first positive item in a 5-mag series, i.e. P(5)). The borderline item has received between 29.17% and 37.5% application responses, making a noticeable difference between B and its adjacent clear items of P on the one hand, and B and its adjacent clear items of ¬P on the other.

The big drop of application percentages suggests that adherence to Tolerance did not spread to the entire series, even if it may have affected categorisation at certain stages. Since the Sorites reasoning results from Tolerance taking global effect on a transitional series, the results indicate that the participants were not trapped into the Sorites reasoning. In this regard, Sorites-susceptibility appears to be a pseudo-problem in the use of a vague predicate. Sooner or later adherence to Tolerance broke down, if Tolerance ever took effect at all.

5.6 General discussion

The chief import from Experiment I is that the application of a vague predicate vis-à-vis a transitional series is not susceptible to the Sorites reasoning. In particular, given that increased similarity in-between the items leads to decreased discriminability, the pattern of application responses in a 5-mag series appears to defy the widely-held assumption that decreased discriminability would lead to more uniformity in the application of a vague predicate. If our findings are anything to go by, there seems to be no unidirectional determining relation between discriminating the difference among objects and applying a

vague predicate to those objects.[5]

A plausible explanation for the observed pattern of responses is that the fundamental purpose of using a predicate — vague or otherwise — is to sort things out into categories. Thereby, the utility of the predicates to establish and maintain mental categories might 'transcend' the minute difference in-between the items to be categorised (recall Loopholes No.1 in §2.2). In other words, the need to sort things out into opposing categories may 'trump' the minute difference in-between the items, so that one would be cautious about, or even disregard, any adherence to Tolerance.

Hence, in categorising a transitional series, the participants may have had in mind two opposing categories, represented by P and ¬P. When the difference in-between items was more noticeable, as in a 10-mag series, around 46.5% of them decided to apply P to the three clear items of P, and to refrain from applying P to the rest. At the same time, around 22.5% of the participants had continued applying P until B. But when the difference in-between the items was less noticeable, as in a 5-mag series, the participants may have become anxious about where to stop. The more conservative ones (around 27.5%) had continued applying P until P(10), the less conservative ones (around 23%) had continued until P(5), and the least conservative ones (around 32%) had continued until B.

If so, we may extrapolate that, with even smaller difference in-between the items, there would be even greater inter-subjective variance in the exact point at which one would stop applying P (Raffman 1994). Thus, while minute difference in-between the items does not induce Tolerance, it is likely to induce inter-subjective variability in where to draw the boundary within the borderline area.

To forestall an objection, it may be countered that the absence of Tolerance effect is due to the presentation of seven items to the participants at one go. The thought is that the participants may be more likely to adhere to Tolerance (or at least for a longer time) if the items are presented to them one by one (Kamp 1981). However, the reason we did not opt for such an experimental setting is that presenting the items separately could increase the memory load on the part of the participants. If they were to remember the item(s) previously seen, they may shortly get tired and start to consider the application of P to each item in isolation.[6] If so, presenting the items separately may have the

5 In a talk given at the Institute of Philosophy/Hertfordshire Phen Quals Project (Jan 2010) entitled 'Can We Really See a Million Colours?' David Papineau suggested that the ability to discriminate colours may not have much bearing on the application of colour concepts. Hence we may be able to discriminate a million colours while using only thirteen colour concepts for categorisation. Our findings here seem to confirm his point.

6 We could not instruct the participants to base their categorisation judgements on the simi-

unwelcome effect of reducing the participants' tendency to compare the items and make categorisation judgements on the basis of such comparison. Such a tendency is, of course, the backbone of Tolerance.

Would it be a better move is to present the items pair by pair, so that the participants could focus on the application of P vis-à-vis a pair of adjacent items, instead of an entire series?[7] Not really, because presenting the items in twos may send out the wrong message that the participants are to pick only the item that satisfies P to the greater extent, especially when the pair consists of a clear item and a borderline one. All things considered, presenting the seven items at one go seems to have given the participants the most leeway for taking into account the similarity in-between the items. Whether or not they would make categorisation judgement on the basis of such comparison was precisely what we wanted to find out.

Moreover, on the basis of the results that the borderline case elicited between 29.17% and 37.5% application responses in Experiment I, a possible point of criticism is that we have not picked a maximally borderline case to start with (cf. §6.5 below). In response, note first that what is regarded as a maximally borderline item in a transitional series may vary drastically from individual to individual. More importantly, we are not interested in finding out what the most marginal item in a transitional series is, but how application responses change from one relative position to another in the series. For this purpose, an item that is borderline enough would do. In addition, the fact that the percentages were below 50% — a percentage commonly associated with the application responses to a maximally borderline case — could also be due to the participants' conservative attitudes in categorisation. That is, some of the participants may have been reluctant to select an item when they were uncertain whether P definitely applies to it.

Lastly, while we have observed similar patterns of categorisation in the two types of series, it is interesting to note that slightly different application responses were elicited with respect to the identical items used in the two trials. For instance, 75.83% of the participants categorised P(10) as P in a 10-mag series, whereas in a 5-mag series, 88.33% of the participants categorised P(10) as P. A plausible explanation seems to be that P(10) was the second most clear item of P in a 5-mag series but the third one in a 10-mag series. In other words, the participants may have taken into account the relative position of an item in the series in making their choices.

larity between the items, for such an instruction would constitute a bias for Tolerance.

7 See Raffman 2000, Schroer 2002, Horsten 2010 for discussion on detailed suggestions and potential disadvantage of such an experimental design.

5.7 Conclusion

To conclude, the findings in Experiment I seem to lend support to the latter part of the rationale in (4) (repeated below):

(12) Provided that Sorites-susceptibility is induced by Tolerance, one should be more reluctant to change the verdict of P-application when the difference between a pair of adjacent objects in a transitional series is smaller. Conversely, if one is more willing to change the verdict of P-application when the difference between the pair is smaller, there would be no evidence for one's adherence to Tolerance, and hence no evidence for Sorites-susceptibility in the use of a vague predicate.

For all we have observed, the participants changed their verdicts of P-application vis-à-vis a transitional series, despite of the increased similarity in-between the items. Moreover, smaller differences in-between the items seem to induce greater inter-subjective variability in where to draw the boundary between the application and the non-application of P. Hence, even if Tolerance were adhered to at an early stage of P application vis-à-vis a transitional series, sooner or later it would break down, so that one would not apply a vague predicate in a Sorites fashion. If so, Sorites-susceptibility appears to be a pseudo-problem in the use of vague predicates.

6 Experiment II: Resemblance bias in borderline categorisation

In this section we report the procedures and the results of Experiment II and discuss its implications. To repeat, the following set of hypotheses was put to test:

(13) a. **Hypothesis II-a:**
Given an ideal, maximally borderline case, the general verdict of the application of P to it is about half application, half non-application.

b. **Hypothesis II-b:**
When the resemblance between B and clearly positive instances of P is salient, B is more likely to be judged as an instance of P.

c. **Hypothesis II-c:**
When the resemblance between B and clearly negative instances of P is salient, B is less likely to be judged as an instance of P.

At this point, the reader would notice that the results from Experiment I have already lent support to Hypothesis II-a. As shown in Fig 1, the low percentages of application in clear cases of ¬P stand in stark contrast with the intermediate percentages of application in borderline cases. In other words, there is much leeway, rather than omission, among competent speakers in the application of P to B. If so, conceptual flexibility, as opposed to conceptual laziness, appears to prevail with respect to P-application in borderline cases.

Now it would not be surprising if similar results are replicated in Experiment II. In this light, the focus of Experiment II is on the testing of Hypotheses II-b and II-c.

6.1 Participants

A randomly composed group of sixty students from the University of Cambridge were asked to complete three versions (3×20) of an online questionnaire. Each participant received 3 GBP for participation. None of the participants in Experiment II took part in Experiment I.

6.2 Materials

For cross-experiment comparison, the same set of topics was used in Experiment II as in Experiment II (see Table 1). Participants were given the same set of instructions in both experiments (see §5.2).

6.3 Manipulations

The set of multiple answers presented for a controlled task contained five items: two items that clearly instantiate P, a borderline item, and two items which clearly not instantiate P. The controlled variable was the relative similarity between the borderline item and the clear items in an uneven series. 'Uneven' means that the difference in-between the items was not identical, so that the objects were not evenly distributed as they were in Experiment I. That is, the borderline item either resembled the clear items of ¬P to a greater extent or resembled the clear items of P to a greater extent. In order to minimise Tolerance effect in Experiment II, the items in an answer set were controlled to differ from each other by at least 10 magnitudes.

More specifically, in the first type of answer-sets the borderline item B differed from the first item which clearly does not instantiate P by 20 magnitudes, i.e. ¬P(20), and the second item which clearly does not instantiate P by 10 magnitudes, i.e. ¬P(10), while differing from the first item that clearly instantiates P by 30 magnitudes, i.e. P(30), and the second item that clearly

instantiates P by 20 magnitudes, i.e. P(20). Since the resemblance between B and clear items of ¬P was more salient, it was predicted that under the ¬P-resemblance bias, B would be less likely to be ticked as an instance of P.

In the second type of answer-sets, B differed from the first item which clearly does not instantiate P by 30 magnitudes, i.e. ¬P(30), and the second item which clearly does not instantiate P by 20 magnitudes, i.e. ¬P(20), while differing from the first item that clearly instantiates P by 20 magnitudes, i.e. P(20), and the second item that clearly instantiates P by 10 magnitudes, i.e. P(10). Since the resemblance between B and clear items of P was more salient, it was predicted that under the P-resemblance bias, B would be more likely to be selected as satisfying P.

For neutral comparison, in the third type of answer-sets the items were evenly distributed so that B differed from the first item which clearly does not instantiate P by 20 magnitudes, i.e. ¬P(20), and the first second which clearly does not instantiate P by 10 magnitudes, i.e. ¬P(10), while differing from the first item that clearly instantiates P by 20 magnitudes, i.e. P(20), and the second item that clearly instantiates P by 10 magnitudes, i.e. P(10). Since it was neither salient that B resembled clear items of ¬P, nor salient that B resembled clear items of P, it was predicted that under no resemblance bias, the application responses to B would be in-between those under the P-resemblance bias and those under the ¬P-resemblance bias. Table 5 illustrates the three types of answer-set patterns with examples.

The sixty participants were divided into three groups to complete three versions of the questionnaire. In order to avoid familiarity to either type of resemblance bias, in each of the first two versions of the questionnaires, half of the controlled tasks contained answer-sets with the P-resemblance bias and the other half with the ¬P-resemblance bias. The third type of the questionnaire contained answer-sets under no resemblance bias.

6.4 Results

We collected twenty responses for each item and calculated the percentage of application responses over all responses. The results were shown in Tables 6-8 (the numbers were rounded to hundredths).

As in Experiment I, we were most interested in the overall tendency of applying a vague predicate to a borderline item under different resemblance biases. Hence, in Tables 6-8, we averaged out the percentages of application responses for each relative position across the six controlled topics. This enabled us to abstract away topical differences and obtained an idealised picture of the application responses to the relative positions in the three types of series (see §6.6 for discussion on a few series that conflicted with the average pattern).

Variable val.	Answer-set patterns
¬P-resemblance bias	In this task you are invited to choose some BLOSSOMED ROSE(S). *Judging from your general experience*, please choose from the following options the one(s) that you think are BLOSSOMED. You may pick as MANY roses as you like but please do NOT choose any more than you would like.  I. ¬P(20); ¬P(10); B; P(20); P(30)
P-resemblance bias	In this task you are invited to choose some BLOSSOMED ROSE(S). *Judging from your general experience*, please choose from the following options the one(s) that you think are BLOSSOMED. You may pick as MANY roses as you like but please do NOT choose any more than you would like.  II. ¬P(30); ¬P(20); B; P(10); P(20)
No-resemblance bias	In this task you are invited to choose some BLOSSOMED ROSE(S). *Judging from your general experience*, please choose from the following options the one(s) that you think are BLOSSOMED. You may pick as MANY roses as you like but please do NOT choose any more than you would like.  III. ¬P(20); ¬P(10); B; P(10); P(20)

Table 5 Three types of answer-set patterns in Experiment II

Items / Topics	¬P(20)	¬P(10)	B	P(20)	P(30)
Withered leaf	0%	5%	30%	80%	85%
Ripe tomato	5%	0%	20%	85%	100%
Dark chocolate	0%	0%	15%	100%	100%
Blossomed rose	10%	10%	15%	100%	100%
Tree with a big shade	0%	20%	45%	90%	90%
Long table candle	5%	10%	65%	100%	100%
Average	3.33%	7.5%	31.67%	92.5%	95.83%
Standard variation	1.67%	3.10%	8.13%	3.59%	2.71%

Table 6 Application responses under ¬P-resemblance bias

We then projected the parings of average percentages and relative positions in each type of the series onto a two-dimensional coordinate, and juxtaposed the three graphs in Figure 2.

6.5 Interpretation of the results

The above findings reveal two main trends in the application of a vague predicate to a borderline item. Firstly, we have observed a considerable difference between the application responses to B and to the clear items of P on the one hand, and between the responses to B and to the clear items of ¬P on the other. Across the three trials, around 31.7% to 46.7% of the participants applied P to B. In contrast, less than 3% of the participants applied P to the items that clearly does not instantiate P. Thereby, the results seem to support the latter part of the rationale in (5) (repeated below):

(14) Provided that borderline-admissibility is a case of pre-semantic indecision, if it is induced by conceptual laziness, a borderline object

Items / Topics	¬P(30)	¬P(20)	B	P(10)	P(20)
Withered leaf	0%	0%	45%	80%	85%
Ripe tomato	5%	5%	15%	60%	100%
Dark chocolate	5%	5%	30%	85%	100%
Blossomed rose	5%	5%	50%	85%	100%
Tree with a big shade	0%	0%	80%	95%	90%
Long table candle	0%	0%	60%	85%	95%
Average	2.5%	2.5%	46.67%	81.67%	95%
Standard variation	1.12%	1.12%	9.28%	4.77%	2.58%

Table 7 Application responses under P-resemblance bias

> should be categorised similarly to an object to which P clearly does not apply, and receive an overwhelming amount of non-application verdicts. Conversely, if it is induced by conceptual flexibility, a borderline object should be categorised differently from a clearly negative object, and receive a similar amount of application and non-application verdicts.

That is, provided that the participants *qua* native English speakers were fully aware of the relevant conventions with respect to the use of predicates being tested, the fact that roughly 30% to 50% of them decided to apply P to B indicates that the pre-semantic lack of convention governing the application of P in B does not imply conceptual laziness, i.e. the tendency to omit the application of P in B, so that one would have withheld from applying P to B, in much the same way as one withheld from applying P to clearly negative cases. Instead, the pre-semantic indecision seems to give rise to conceptual flexibility, on the basis of which the participants decided, possibly in accordance with pragmatic factors, how to respond to a borderline case. Secondly, the responses

Items / Topics	¬P(20)	¬P(10)	B	P(10)	P(20)
Withered leaf	5%	10%	35%	65%	70%
Ripe tomato	0%	0%	15%	85%	100%
Dark chocolate	0%	0%	5%	80%	100%
Blossomed rose	10%	10%	30%	80%	95%
Tree with a big shade	0%	20%	55%	100%	100%
Long table candle	0%	15%	65%	85%	100%
Average	2.5%	9.17%	34.17%	82.5%	94.17%
Standard variation	1.71%	3.27%	9.35%	4.61%	4.90%

Table 8 Application responses under no resemblance bias

to B seemed to be biased by the salient resemblance it bore to the clear items of P or ¬P. That is, while the responses to the clear items differed very little under the three types of resemblance biases, there was a significant difference among the application responses to B across the three types ($p=0.037$, $H(2)=6.595$). Hence, the initial hypothesis in (8) (repeated below) was borne out:

(15) a. **Hypothesis II-b:**
If the resemblance between B and clearly positive instances of P is salient in a context, B is more likely to be judged as an instance of P in that context.

b. **Hypothesis II-c:**
When the resemblance between B and clearly negative instances of P is salient in a context, B is less likely to be judged as an instance of P in that context.

In this connection, the conceptual flexibility regarding the application of P to B seems to be modulated by the salient resemblance between B and

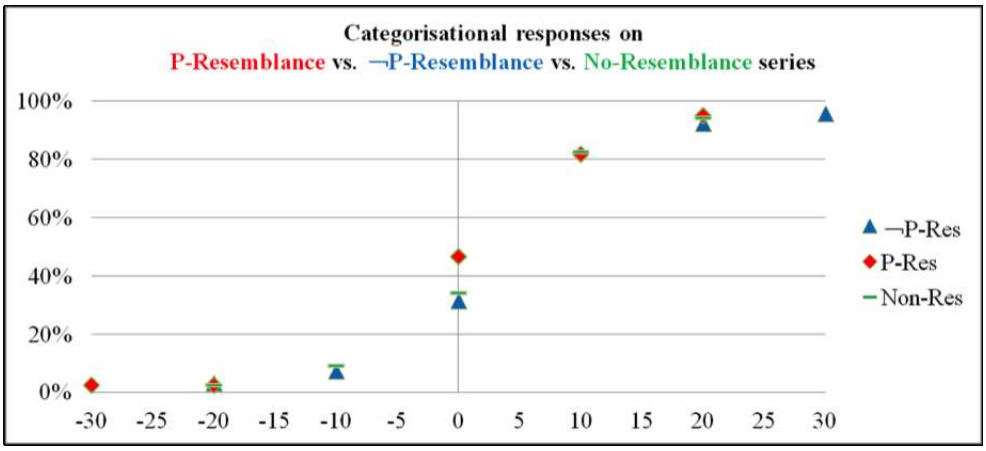

Figure 2 Application responses under three kinds of resemblance biases

clearly positive/negative items. Hence, the results indicate that the verdict of P-application in borderline cases may have involved consideration of the situation in which the categorisation takes place. In this regard, it may be said that borderline-admissibility manifests in language use not only as a matter of flexible choices, but also as a matter of *situationally* conditioned choices. If so, our findings seem to lend support to those proposals that deem contextual variability as relevant to the use of vague predicates (Kamp 1981, Raffman 1994, Graff 2000, Åkerman & Greenough. 2010, but cf. Stanley 2003).

6.6 General discussion

The chief import from Experiment II is that the application of a vague predicate to a borderline object is systematically varied as a result of the different clear cases presented in the three trials. A plausible explanation for the observed patterns of response, following Raffman (1994), is that one's *conception* of the paradigmatic instances of P is variable.

That is, when the resemblance between B and items that clearly instantiate P is salient, the paradigms of P invoked in this context may be closer to B than the paradigms of ¬P invoked. Hence B is more likely to be categorised as an instance of P. *Mutatis mutandis* for a context wherein the resemblance between B and items that clearly not instantiate P is salient, whereby B is less likely to be categorised as an instance of P. Now if the conception of the

paradigmatic instances of P is contextually variable, acquiring the meaning of P is unlikely to be a matter of fixing the intension of P once and for all. On this score, the meaning of P could be *underdetermined* with respect to how the intension of P is to be fixed in different situations.

However, it is worth noting that the resemblance bias did not take effect for a couple of topics. For instance, in a series of ripe tomatoes, the borderline case received 20% application responses under the ¬P-resemblance bias, as opposed to 15% under the P-resemblance bias. While the responses to B appear to defy the resemblance bias, it is interesting to note that under the P-resemblance bias, P(10) in the series received only 60% application responses, as opposed to 85% under no resemblance bias. In this case, there seems to be a reverse bias: the non-application of P to B may have biased in slight favour of the non-application of P to P(10). Because of the salient similarity between B and P(10), the low application responses to B may have lowered the application responses to P(10).

Furthermore, in the series of long table candles, the borderline case received 65% application responses under the ¬P-resemblance bias, as opposed to 60% under the P-resemblance bias. In this case, the responses to B appear to be immune to the resemblance bias, for the responses also stood at 65% under no resemblance bias. Lastly, notice that the overall application responses to B were higher in a 5-item series (32%-47%) in Experiment II than in a 7-item series (27%-38%) in Experiment I. In particular, in a P-resemblance, 5-item series, the average percentage was close to 50%. It seems that the participants were more willing to apply P to B on pragmatic grounds, when there were fewer choices and/or B was perceived to be quite similar to the clear items of P.

6.7 Conclusion

In a nutshell, the findings from Experiment II illustrate the effect of resemblance bias on the application of a vague predicate to a borderline object. Since the categorisation of a borderline item is systematically biased by the salient resemblance between B and clear cases of P or ¬P in context, the application of P to B seems to be contextually conditioned, in addition to being pre-semantically undecided. In this respect, borderline-admissibility appears to straddle the interface between semantics and pragmatics.

7 Summary

In this paper we have reported two experiments conducted to investigate the application of a vague predicate vis-à-vis different types of transitional series.

Experiment I tested the potential effect of Tolerance on the application of P. It is found that minute difference in-between the items in a transitional series did not induce uniform application responses. To the contrary, Tolerance — had it ever been adhered to — broke down before or upon the application of P to the borderline item in the series. Since the Sorites reasoning, which is induced by Tolerance taking global effect on a transitional series, does not materialise in the use of vague predicates, Sorites-susceptibility appears to be a wrong way of characterising vagueness in use.

Experiment II tested the potential effect of resemblance bias on the application of P to its borderline cases. It is found that the application responses to B were significantly biased by the salient resemblance between B and clear items of P (or ¬P). As a result, borderline-admissibility construed as pre-semantic indecision needs to be supplemented by pragmatic variability, in order to capture the manifested vagueness in language use.

All in all, if the experimental findings are anything to go by, Sorites-susceptibility seems to be an over-rated problem, or even a pseudo-problem for the theorisation on vagueness in language use. Instead, borderline-admissibility *qua* flexibility in language use, especially its implication for how the meaning of vague predicates is to be construed, merits further research.

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