

Very necessary: the meaning of non-gradable modal adjectives in discourse contexts

Maryam Rajestari¹, Simon Dobnik², Robin Cooper², Aram Karimi²,
¹Saarland University, Saarbrücken, Germany
²CLASP and FLOV, University of Gothenburg, Sweden

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Modality is the ability of human beings to talk about events and situations beyond here and now and it interprets different degrees of “possibility”, “necessity”, “obligation” and “permission”. This ability is unique to human beings and children use it even from the early stages of their language development.

Modified from [Matthewson \(2016\)](#)

Portner and Rubinstein (2014)

- ▶ Non-gradable modal adjectives:
 - ▶ A: It is crucial that our uninsured citizens get insurance.
B: And it's crucial that we allow people to make their own choices.
A: So we're stuck.
- ▶ Gradable modal adjectives:
 - ▶ A: It is important that our uninsured citizens get insurance.
B: It's also important that people make their own choices.
A: So how do we balance these things?

A new take on gradable adjectives

- ▶ The meaning of words is negotiated within the communicative context.
- ▶ Modifiers shift the meaning of the non-gradable adjectives to being gradable.
- ▶ Meaning of words is not fixed but fluid, relative to the contexts they are used in.

Cooper (in prep); Clark (1996)

- Q1 To what extent are “non-gradable” adjectives used as gradable?
- Q2 What is the semantics of non-gradable modal adjectives when they co-occur with degree modifiers?

Examples were chosen from the ukWaC corpus (Baroni et al., 2009) which is a very large corpus of British English sampled from websites in the .uk domain. The corpus contains more than a billion words.

Q1: Gradable use? :: very A

$N = 2,283,659,645$

Mod	A	C(Mod)	C(A)	C(Mod A)	$-2\log\lambda$	p	$p < 0.05$	H_2 vs. H_1
very	necessary	1990348	346547	740	450.95	4.47e-100	1	8.39e+97
very	crucial	1990348	69852	177	145.76	1.46e-33	1	4.49e+31
very	vital	1990348	115505	120	3.5	0.06	0	5.75
very	essential	1990348	225925	136	21.17	4.2e-6	1	3.96e+4
very	compulsory	1990348	41967	0	73.19	1.18e-17	1	7.80e+15
very	certain	1990348	314719	169	46.94	7.33e-12	1	1.56e+10
very	important	1990348	775926	41389	inf	0.0	0	inf
very	appropriate	1990348	403227	820	453.06	1.56e-100	1	2.40e+98
very	proper	1990348	107779	157	35.19	2.99e-9	1	4.38e+7
very	likely	1990348	365718	4989	inf	0.0	0	inf

Q1: Gradable use? :: extremely A

$N = 2,283,659,645$

Mod	A	C(Mod)	C(A)	C(Mod A)	$-2\log\lambda$	p	$p < 0.05$	H_2 vs. H_1
extremely	necessary	147641	346547	21	0.09	0.76	0	1.05
extremely	crucial	147641	69852	15	15.05	1.05e-4	1	1.85e+3
extremely	vital	147641	115505	23	20.69	5.41e-6	1	3.10e+4
extremely	essential	147641	225925	11	0.97	0.32	0	1.63
extremely	compulsory	147641	41967	0	5.43	0.02	1	15.08
extremely	certain	147641	314719	2	27.42	1.64e-7	1	8.99e+5
extremely	important	147641	775926	5733	inf	0.0	0	inf
extremely	appropriate	147641	403227	20	1.54	0.21	0	2.16
extremely	proper	147641	107779	1	8.05	4.54e-3	1	56.09
extremely	likely	147641	365718	166	362.50	8.08e-82	1	5.22e+78

Q1: Gradable use? :: fairly A

$N = 2,283,659,645$

Mod	A	C(Mod)	C(A)	C(Mod A)	$-2\log\lambda$	p	$p < 0.05$	H_2 vs. H_1
fairly	necessary	99431	346547	3	14.49	1.41e-4	1	1.40e+3
fairly	crucial	99431	69852	20	41.43	1.22e-10	1	9.90e+8
fairly	vital	99431	115505	7	0.69	0.41	0	1.41
fairly	essential	99431	225925	24	14.49	1.40e-4	1	1.40e+3
fairly	compulsory	99431	41967	0	3.65	0.06	0	6.22
fairly	certain	99431	314719	607	inf	0.0	1	inf
fairly	important	99431	775926	146	203.09	4.43e-46	1	1.26e+44
fairly	appropriate	99431	403227	4	15.28	9.26e-5	1	2.08e+3
fairly	proper	99431	107779	0	9.39	2.19e-3	1	109.17
fairly	likely	99431	365718	81	120.60	4.67e-28	1	1.54e+26

Q2: Semantics of gradable use

- ▶ Participants and task:
 - ▶ 120 English native speakers evaluated the meaning of non-gradable modal adjectives within different contexts from the ukWaC corpus.
 - ▶ Context: S_{t-1} S_t S_{t+2} where S_t is a target sentence.

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 - ▶ Context: S_{t-1} S_t S_{t+2} where S_t is a target sentence.
- ▶ Method:
 - ▶ 25 target sentences containing a non-gradable modal adjective and a modifier (**very A**)
 - ▶ 25 target sentences containing only a non-gradable modal adjective (**A**)
 - ▶ 25 modified target sentences (**very A**) from the first set
 - ▶ 25 modified target sentences (**+very A**) from the second set

*“That’s the true value of literature and story – to give delight; and I’m very happy to see it given a home and a museum here in Oxford, where so many stories have begun.”
Jacqueline Wilson, Children’s Laureate 2005-2007 “Stories have always been a very vital part of my world, so a museum devoted to encouraging children to read and enjoy stories seems a wonderful idea. It’s especially fitting that it’s based in Oxford, which from Lewis Carroll onwards has always been associated with brilliant children’s literature.”*

Answers obtained for “vital” in the original (“very vital”) and modified contexts (“~~very~~ vital”)

very vital	C	very vital	C
important	6	important	11
essential	4	essential	3
crucial	3	necessary	3
key	3	central	1
integral	2	consequential	1
intrinsic	1		
engaging	1		
chief	1		
big	1		
substantial	1		
cornerstone	1		
fundamental	1		

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The modified contexts lead the participants to choosing more varied replacements.

Meaning shifts: +very necessary

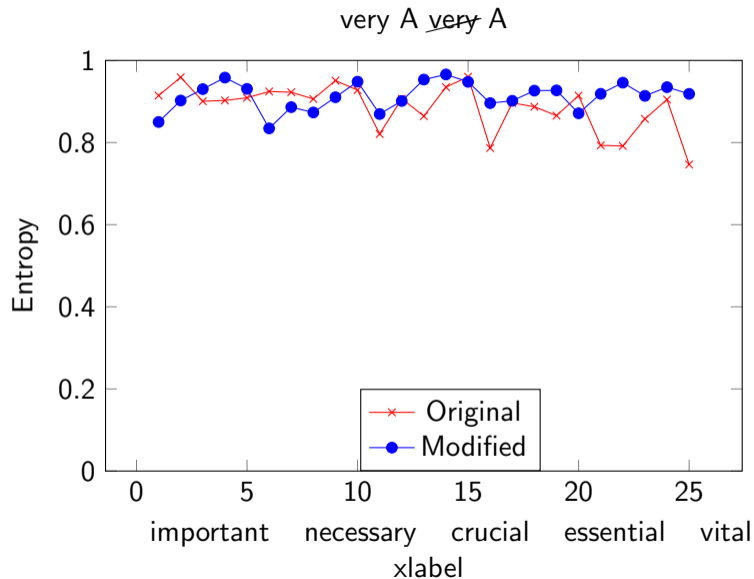
“The bathroom is fully tiled and has a bath with overhead shower, bidet, w.c and wash hand basin. All the necessary bedding, bath and hand towels are provided. A useful store cupboard is located just inside the front door where the boiler is fitted.”

Answers obtained for “necessary” in the original (“necessary”) and modified contexts (“+very necessary”)

necessary	C	+very necessary	C
needed	9	important	7
required	8	essential	6
essential	6	needed	3
requisite	2	basic	3
fundamental	1	fundamental	1
important	1	required	1
indispensable	1	crucial	1
		appropriate	1
		vital	1
		critical	1

- ▶ Entropy of a list of answers models their variation
 - ▶ Ent = 1; all items are equally probable; maximum uncertainty or “mess”
 - ▶ Ent = 0; items are completely predictable, i.e. the same
- ▶ All entropy values are normalised by maximum attainable entropy: $-\log_2(n)$ where n is the size of the set of answers.

Normalised entropies over sentence contexts



Removing a modifier: very A and ~~very~~ A

- ▶ Excluding *important*
- ▶ A two-tailed paired t-test found a significant difference between very-A versus ~~very~~-A ($t(19)=2.179$, $p=0.042$).

Removing a modifier: *very A* and ~~*very A*~~

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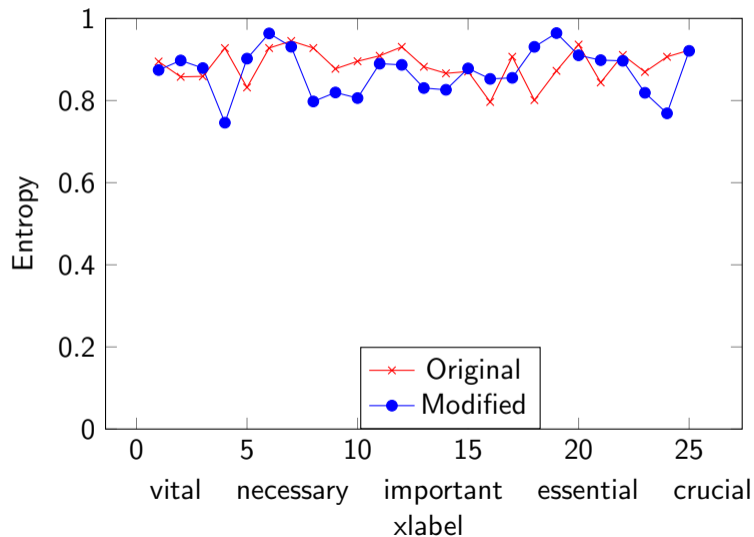
Grouped by adjective

Adjectives	Original(<i>very A</i>)	stdev	Modified (<i>very A</i>)	stdev	diff
important	0.9171	0.024	0.9143	0.041	-0.003
necessary	0.9263	0.016	0.8906	0.0424	-0.036
crucial	0.8974	0.0557	0.9276	0.0407	0.03
essential	0.8701	0.0498	0.9045	0.0233	0.034
vital	0.8188	0.0623	0.9263	0.0135	0.108

very A indicates a lower entropy except for "important" and "necessary"

Normalised entropies over sentence contexts

A and +very A



Adding a modifier: A and +very A

- ▶ Excluding *important*
- ▶ A two-tailed paired t-test found no significant difference between A versus +very-A ($t(19)=1.003$, $p=0.3283$).

Adding a modifier: A and +very A

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Grouped by adjective

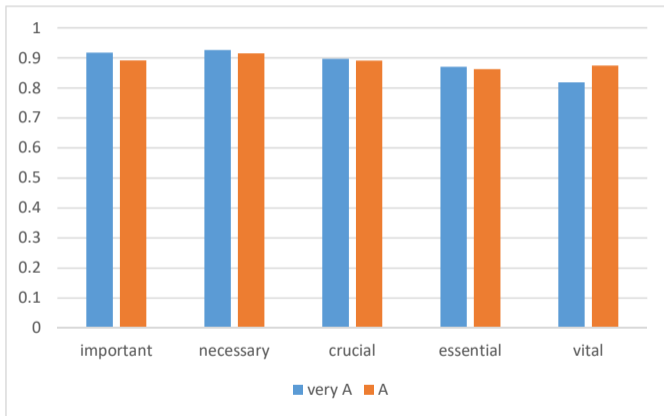
Adjectives	original(A)	stdev	modified (add very A)	stdev	diff
important	0.8918	0.0274	0.8624	0.0314	-0.029
necessary	0.9148	0.0275	0.0776	0.8636	-0.051
crucial	0.8908	0.0328	0.8608	0.0643	-0.03
essential	0.8626	0.0625	0.9027	0.0484	0.04
vital	0.8743	0.0374	0.8599	0.0647	-0.014

A indicates a higher entropy except for "essential"

Natural sentences: very A and A

- ▶ Excluding *important*
- ▶ A two-tailed paired t-test found no significant difference between very A versus A ($t(19)=-0.4688$, $p=0.6445$).

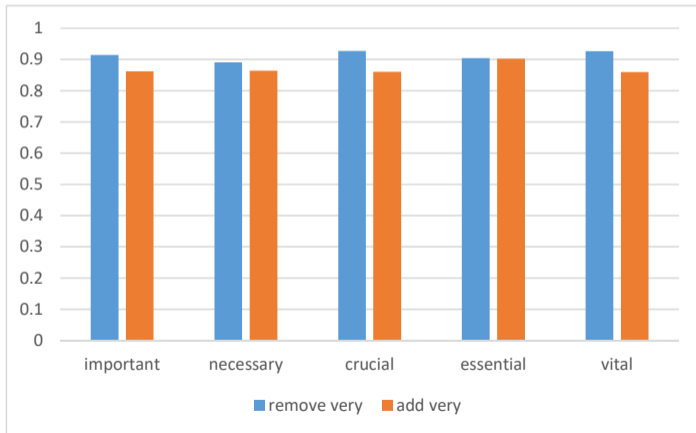
Natural sentences: very A and A



Modified sentences: +very A and ~~very~~ A

- ▶ Excluding *important*
- ▶ A two-tailed paired t-test found a significant difference between +very A versus ~~very~~-A ($t(19)=2.2808$, $p=0.0342$).

Modified sentences: +very A and very A



- ▶ Suppose A is ambiguous between a gradable and non-gradable reading
 - ▶ adding *very* will select gradability and decrease entropy
 - ▶ removing *very* moves from gradability to an ambiguity and increases entropy
 - ▶ if the context requires gradability, entropy will not be affected by adding *very* or by removing it
- ▶ Suppose A is unambiguously non-gradable
 - ▶ adding *very* will coerce to gradable reading and increase entropy
 - ▶ removing *very* will return to the non-gradable reading and decrease entropy
 - ▶ if the context requires gradability, coercion will be required anyway and entropy will not be affected by adding or removing *very*
- ▶ This might explain why we get different entropy results for different examples
- ▶ More data needed
- ▶ Also a better account of entropy based on similarity of the meanings of the substitutions produced by the subjects

- ▶ “Non-gradable” adjectives are used with modifiers in a large corpus of British English.
- ▶ There is a possibility of meaning modification by removing (but not adding) a degree modifier to a non-gradable adjective.
- ▶ Modified contexts sometimes resulted in a larger number of possible replacements (very) and sometimes in the same number of possible replacements (+very).
- ▶ Original contexts very A and A had a similar number of replacements.
- ▶ (Fine-grained) semantic similarity between sentences should/will be evaluated not just possible replacements.
- ▶ The traditional distinction between gradable and non-gradable adjectives is not as straightforward as it was previously thought.

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