

# CRISSP Lecture Series



A program for experimental syntax:  
data, theory, and biology

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University of Connecticut

Theory:

Experimental Syntax and the **theory** of  
island effects.

KU Leuven - Brussels 03.17.15

# Island effects

Island effects are typically defined as extreme unacceptability arising from movement out of certain phrases (islands).

You wonder [whether Jack stole a necklace]

**Whether:** \* What do you wonder [whether Jack stole \_\_\_]?

You make [the claim that Jack stole a necklace]

**Complex NP:** \* What did you make [the claim that Jack stole \_\_\_]?

You worry [if Jack forgets the necklace]

**Adjunct:** \* What do you worry [if Jack forgets \_\_\_]?

You think [the necklace for Jack] is pretty

**Subject:** \* What do you think [the necklace for \_\_\_] is pretty?


Yesterday I developed an experimental method of identifying the (potential) contribution of grammatical constraints to this unacceptability. I'd like to review it briefly now so that everybody is on the same page.

# Three components to island effects

All sentences that contain island effects also contain at least two properties that are independently known to lower acceptability: **long-distance dependencies** and **syntactically complex phrases**.

**Whether island:** \* What do you wonder [whether Jack stole \_\_\_]?


1. **Dependency:** What do you wonder [whether Jack stole \_\_\_]?



2. **Complex phrase:** What do you wonder [whether Jack stole \_\_\_]?

Syntactic theories claim that the unacceptability in island effects cannot be completely explained by the **dependency** and **complexity** difficulties alone. There must be a third factor affecting the acceptability, namely a **grammatical constraint** that prohibits movement out of island structures:

3. **Constraint:** What do you wonder [whether Jack stole \_\_\_]?



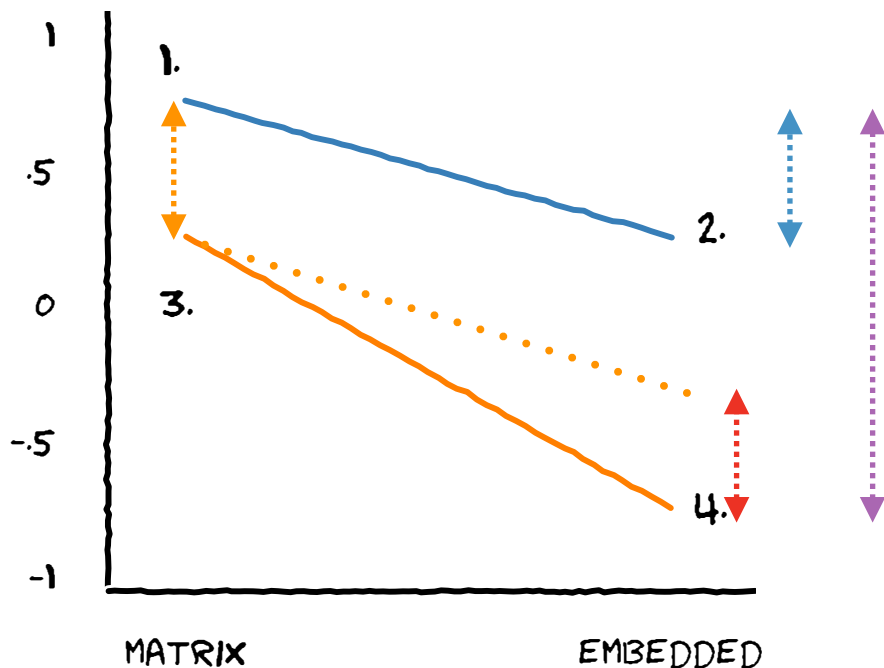
# If there is a constraint, we will see non-crossing non-parallel lines

complex  
phrase  
effect

global effect

1. Who \_\_\_ thinks that Jack stole the necklace?
2. What do you think that Jack stole \_\_\_?
3. Who \_\_\_ wonders whether Jack stole the necklace?
4. \*What do you wonder whether Jack stole \_\_\_?

dependency  
effect



	dependency effect	(1-2)
	complexity effect	(1-3)
+	constraint	+
	global effect	X
		(1-4)

If there is a **grammatical constraint**, the two independent effects won't be enough to explain the total global effect. We'll need to add the constraint's effect in.

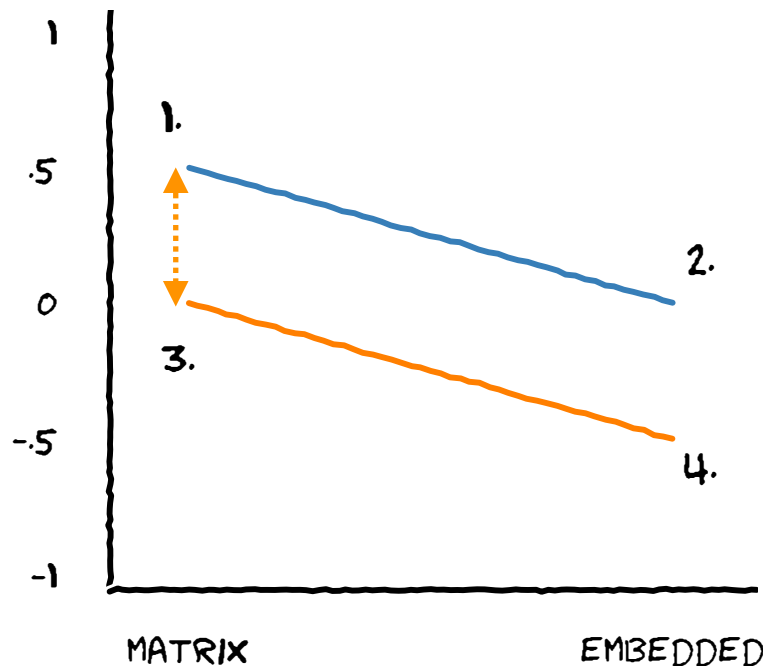
# If there is no constraint, we will see parallel lines

complex phrase effect

global effect

1. Who \_\_\_ thinks that Jack stole the necklace?
2. What do you think that Jack stole \_\_\_?
3. Who \_\_\_ wonders whether Jack stole the necklace?
4. \*What do you wonder whether Jack stole \_\_\_?

dependency effect



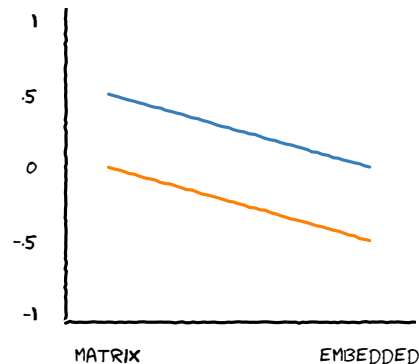
	dependency effect	(1-2)
+	complexity effect	+ (1-3)
		(1-4)
	global effect	

If the two processing costs can completely explain the total unacceptability, then there is no work left for the grammatical constraint to do.

# The logic of this (2x2) design

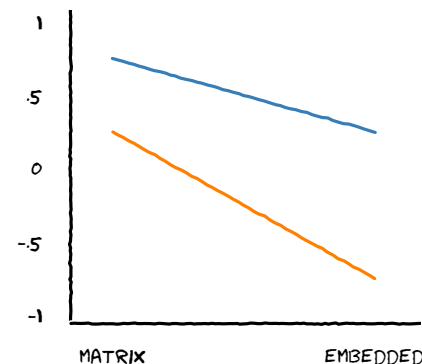
So what can we conclude from this design?

**linearly additive**



No constraint

**super-additive**



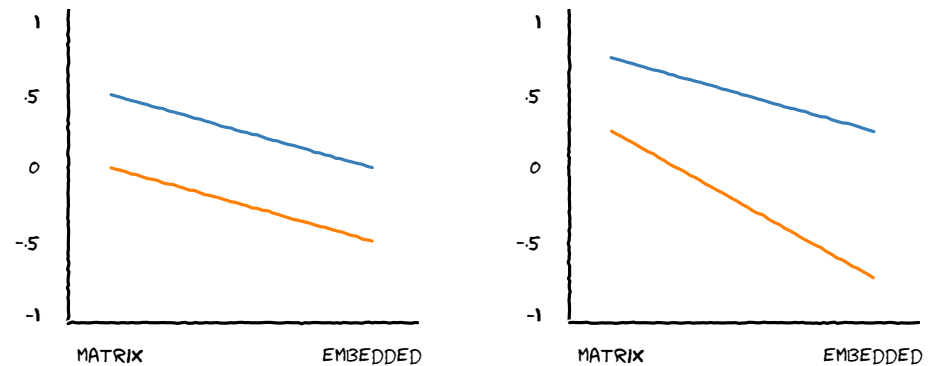
There is a mystery component

You may recall from yesterday that super-additivity (non-crossing, non-parallel lines) is a necessary but not sufficient condition for the presence of a grammatical constraint. Yesterday was all about this uncertainty.

Today I will simply assume that super-additivity indicates the presence of a constraint. I am a syntactician, so my goal is to use syntactic theory to explain facts of the universe!

# Goals for this lecture

What we have here is a new tool for detecting island effects. The logical next step is to apply this tool to existing island facts to see what the pattern of island effects is (according to this tool).



	English	Italian	Swedish	Norwegian	Japanese	Arabic
WH-movement	✓	✓	✓	✓		✓
WH-in-situ	✓				✓	
D-linking	✓		(soon)	(soon)		(soon)
RC-movement	✓	✓	(soon)	(soon)		
Exceptions	✓					

Once we have this new data, we will explore the consequences for syntactic theories.

# Caveat for Subject Islands

(Simple) Subject islands are complicated to test cross-linguistically because they potentially involve preposition stranding. As such, I have developed two different designs depending on the languages being compared.

## Design 1: when p-stranding is possible (standard)

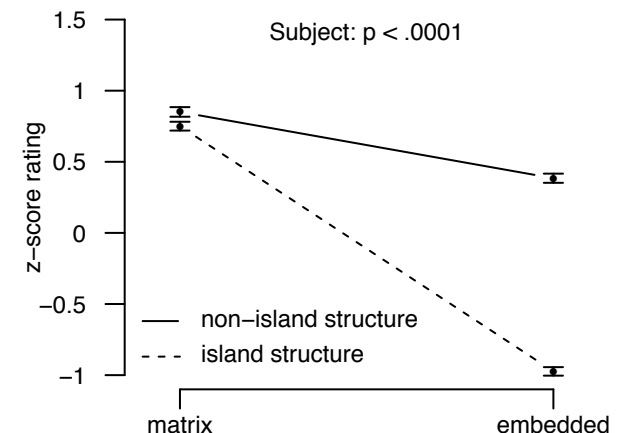
Who \_\_\_ thinks the speech interrupted the TV show?

What do you think \_\_\_ interrupted the TV show?

Who \_\_\_ thinks the speech about politics interrupted the TV show?

\*What do you think [the speech about \_\_\_] interrupted the TV show?

This is the standard design. It manipulates length (matrix and embedded gaps) and the complexity of the subject. It results in the typical graph.





# Caveat for Subject Islands

(Simple) Subject islands are complicated to test cross-linguistically because they potentially involve preposition stranding. As such, I have developed two different designs depending on the languages being compared.

## Design 2: when p-stranding is not possible (non-standard)

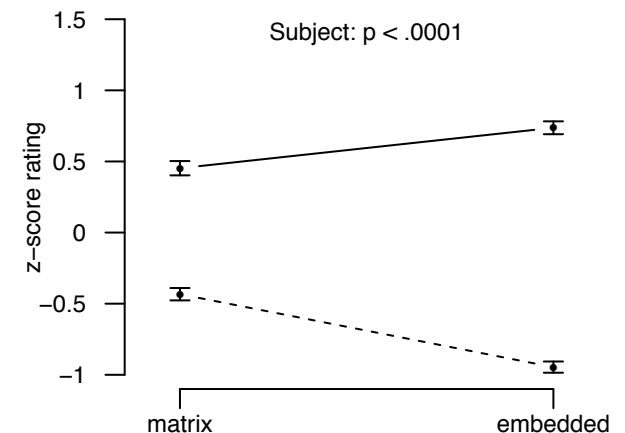
What do you think the speech interrupted \_\_\_?

What do you think \_\_\_ interrupted the TV show?

What do you think **the speech about politics** interrupted the TV show about \_\_\_?

\*What do you think [**the speech about \_\_\_**] interrupted the TV show about politics?

This design is helpful for pied-piping languages because both NPs have PP adjuncts in them. In pied-piping languages, there is no way to identify the gap (no P left behind). By filling the other NP with a PP, it makes it more likely that the participant will apply the displaced PP to the correct NP (the one without a PP).



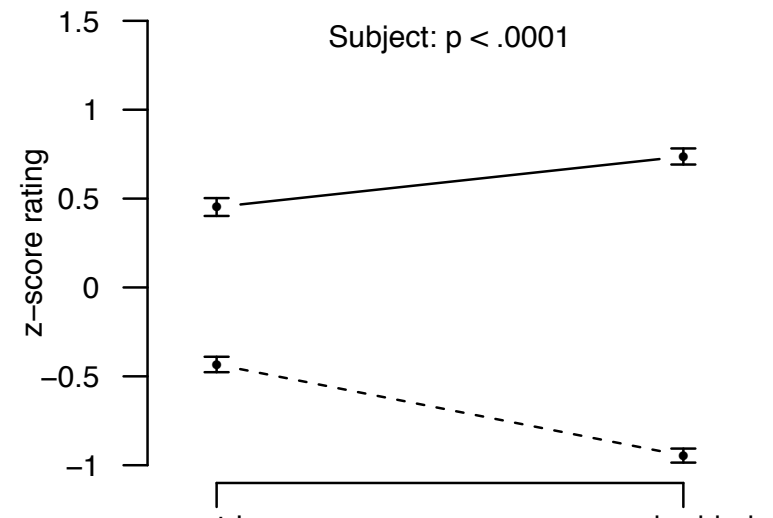
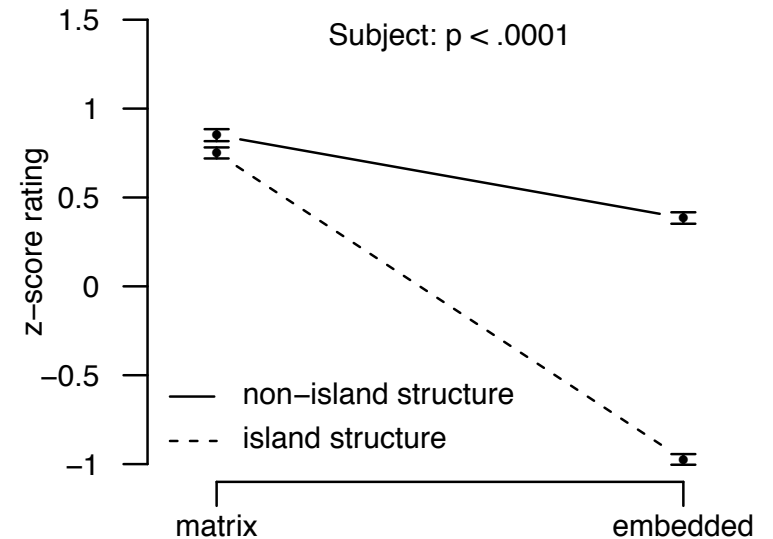
# Caveat for Subject Islands

Both of these designs are valid. The critical issue for us is that they will result in different looking graphs:

The standard design results in the typical shape: a monotonic superadditive interaction (this just means that the slopes of both lines go in the same direction).

The pied-piping design yields a non-monotonic interaction: the slopes of the two lines are in different directions.

As we work through these languages, you will sometimes see this design for Subject islands.



# WH-movement across languages

# The current distribution of island effects

Before showing you the results of the experimental approach, it might make sense to first review what the current literature says about island effects with **WH-movement**:

	Wh-island	Complex NP island	Subject island	Adjunct island
English				
Italian				
Swedish				
Norwegian				
Arabic				



WH-movement is unacceptable.  
Language shows the island constraint





WH-movement is acceptable.  
Language does not show the island constraint

# The current distribution of island effects

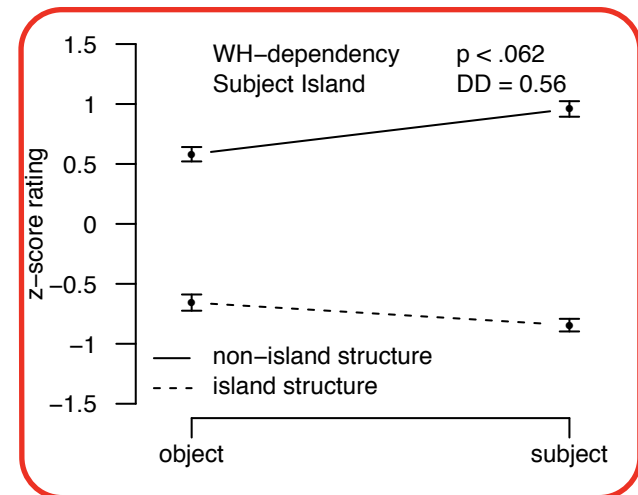
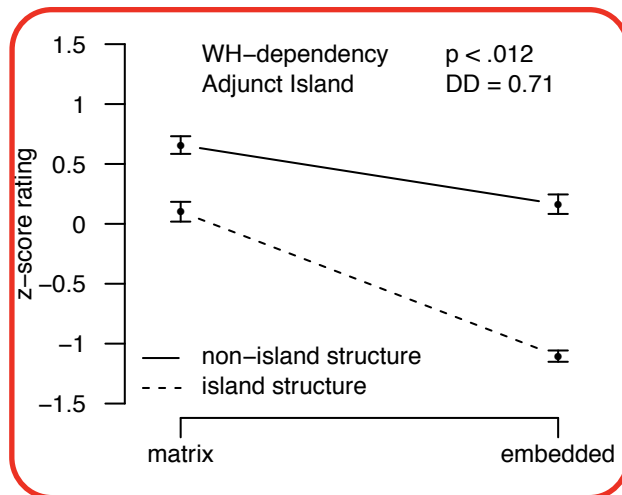
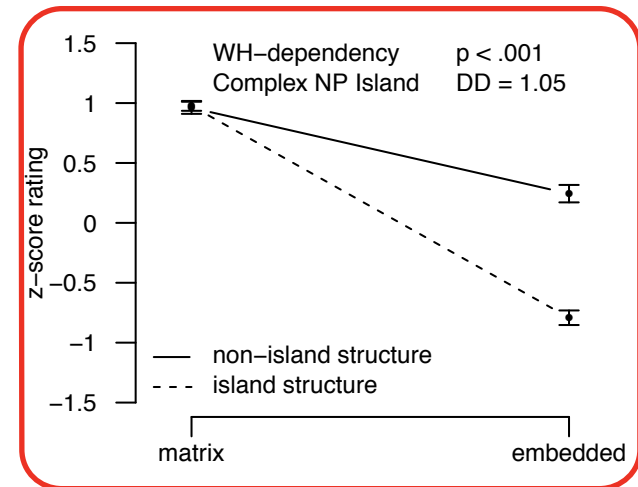
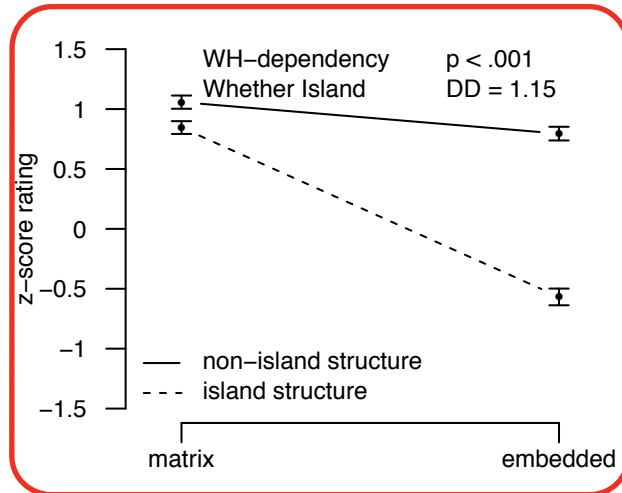
Before showing you the results of the experimental approach, it might make sense to first review what the current literature says about island effects with **WH-movement**:

	Wh-island	Complex NP island	Subject island	Adjunct island
English	Red	Red	Red	Red
Italian	Green	Red	Green	Red
Swedish	Orange	Orange	Orange	Orange
Norwegian	Orange	Orange	Orange	Orange
Arabic	Red	Green	Grey	Red

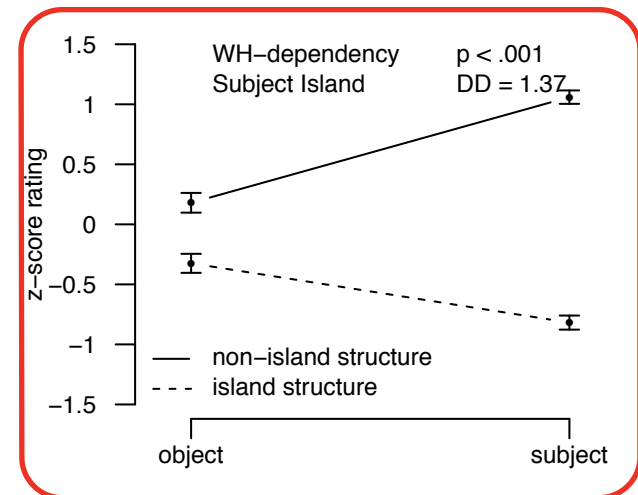
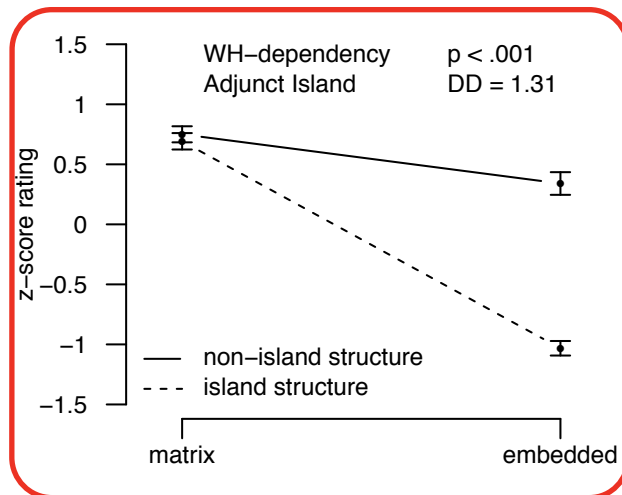
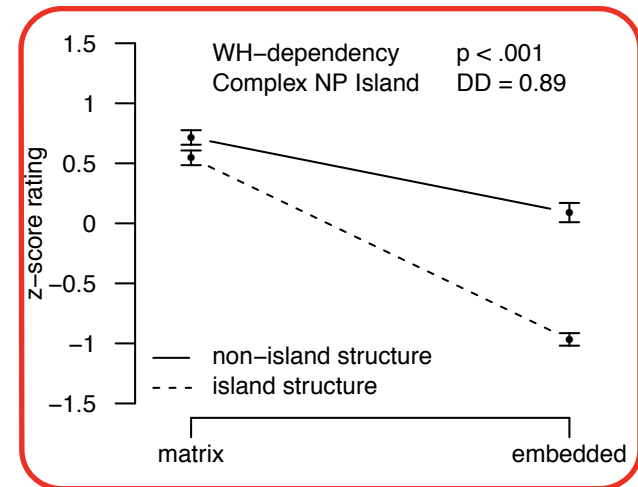
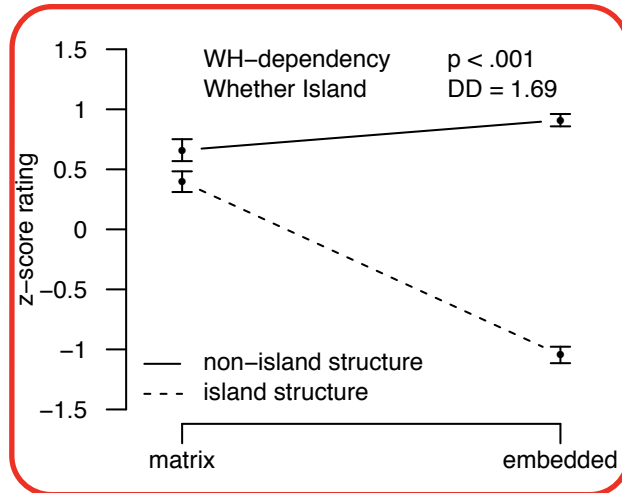
 WH-movement is unacceptable.  
Language shows the island constraint

 WH-movement is acceptable.  
Language does not show the island constraint

# We've already seen English WH-movement

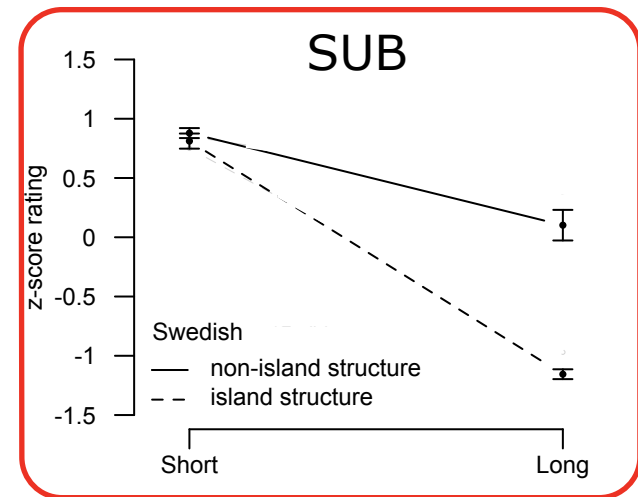
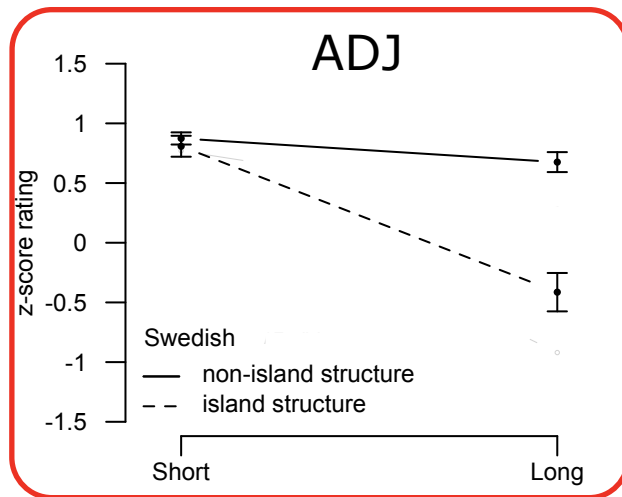
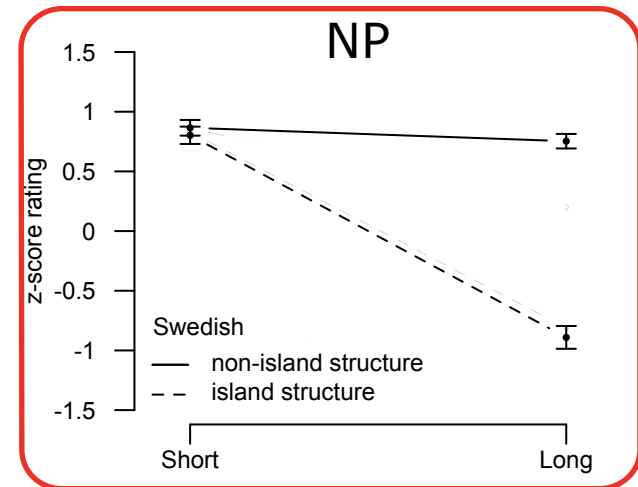
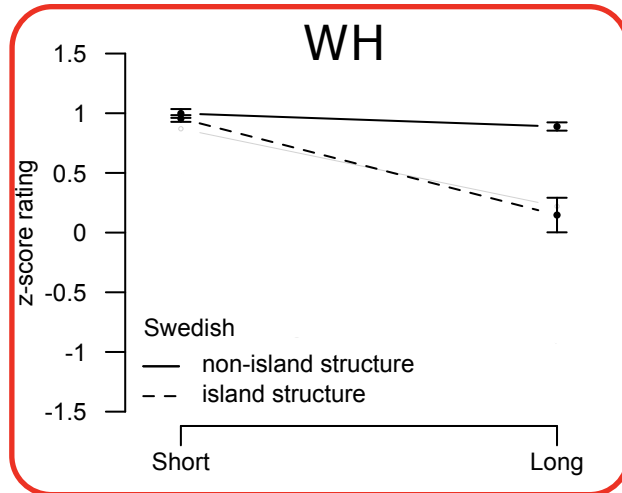


# Italian WH-movement



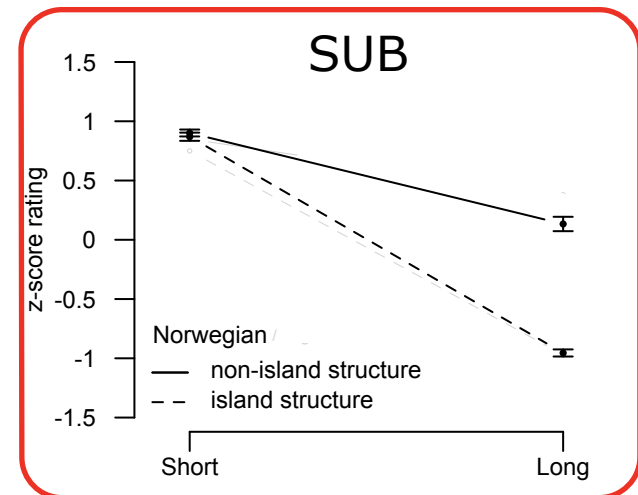
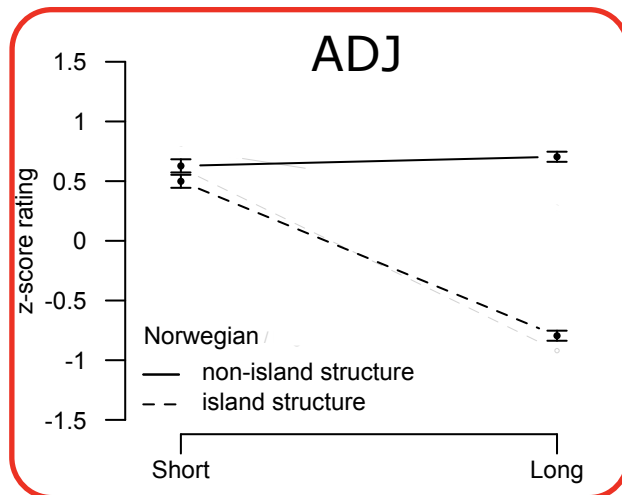
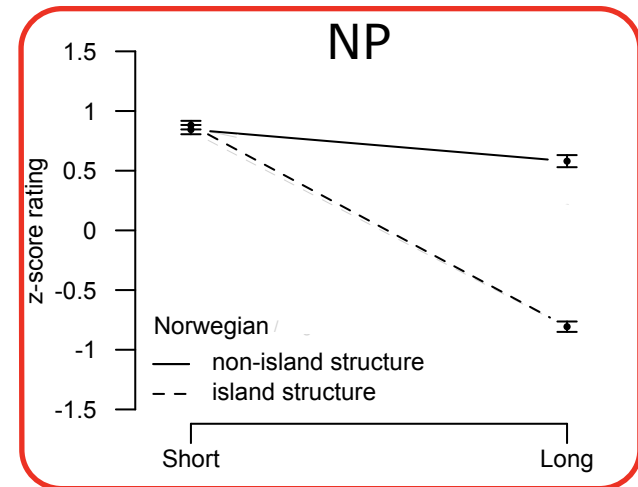
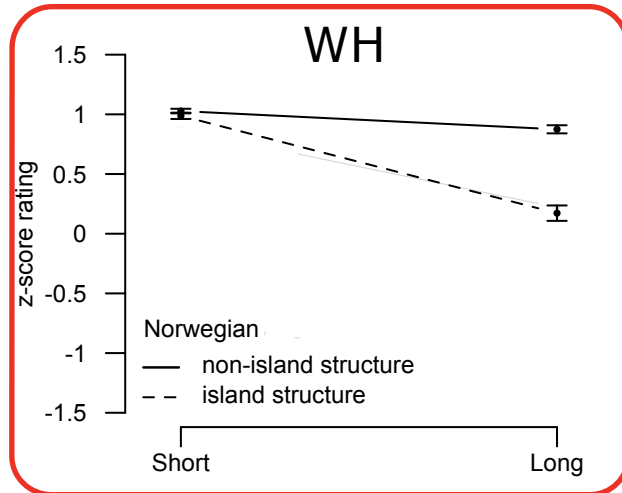
It is interesting to note that Italian WH-movement is not often discussed in the islands literature.

# Swedish WH-movement



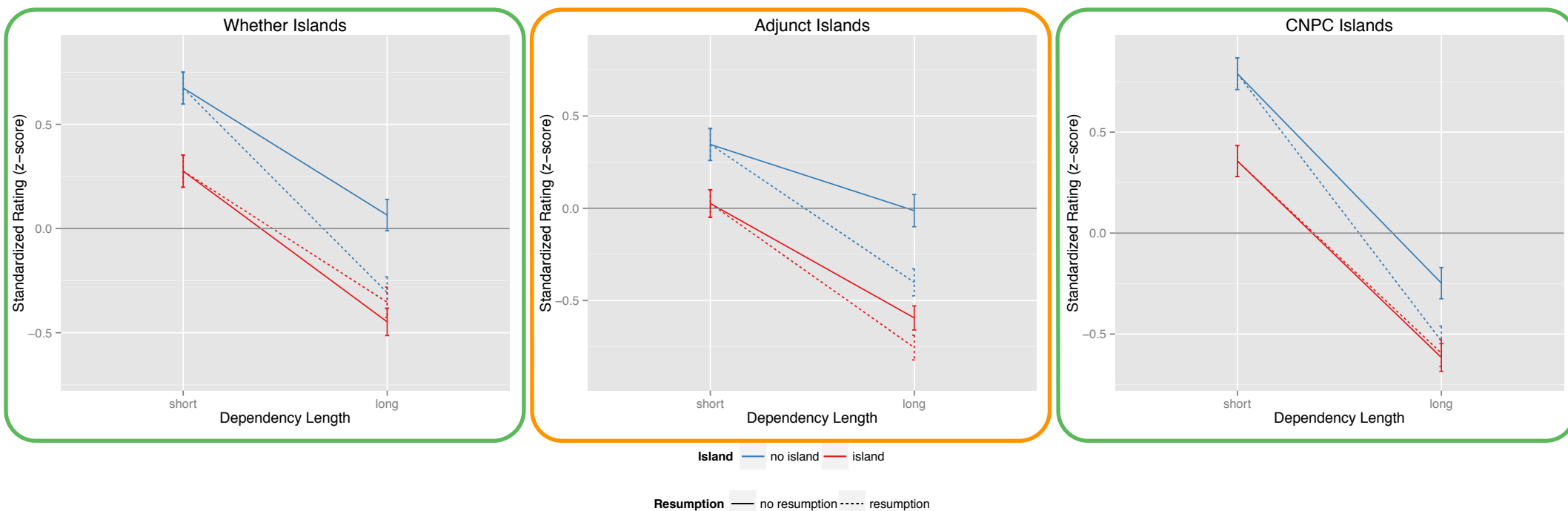


# Norwegian WH-movement



# Arabic WH-movement

This is work in progress with Matt Tucker (lead), Alid Idrissi, and Diogo Almeida. It is looking at both island effects and resumptive pronouns.

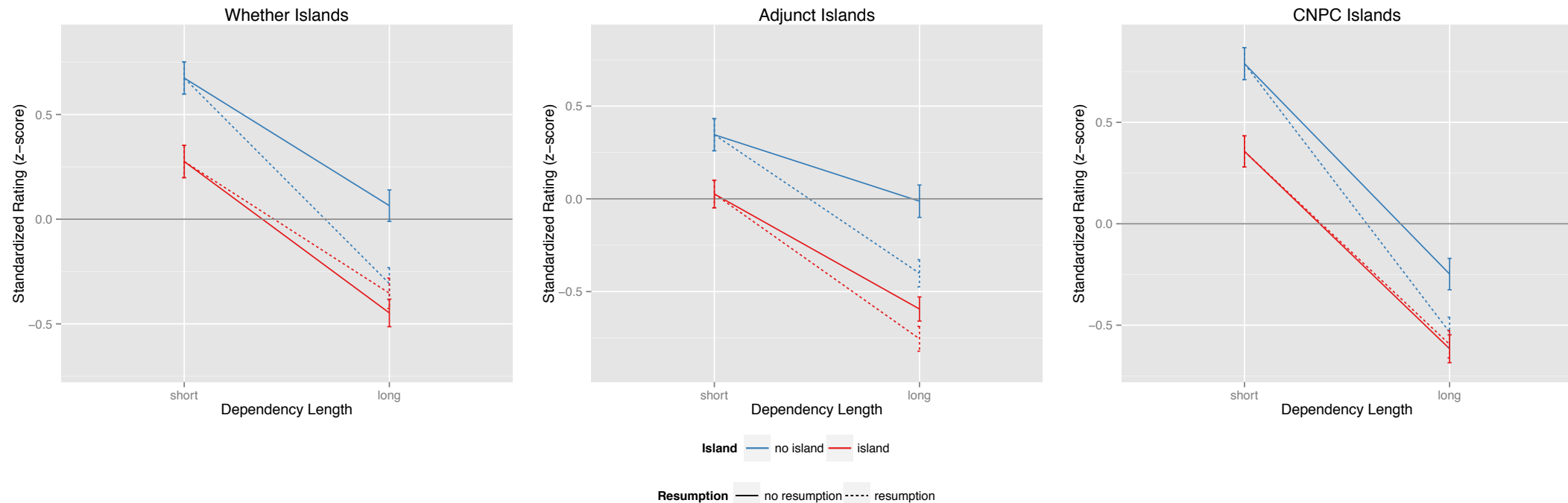


The solid lines represent the island effects with gaps. The dashed lines are the effect of resumption.

The solid lines represent the island effects with gaps. The dashed lines are the effect of resumption. We couldn't test Subject islands because extraction of an embedded subject is always unacceptable (probably a that-trace effect).

# Side note: Resumption is not helping

It has been reported that resumptive pronouns ameliorate island effects in Arabic. But we don't see it in this experiment.



First, we see a dramatic decrease in acceptability for resumption in non-island contexts (the blue dashed line).

Second, we either see (statistically) identical ratings for resumption and gaps inside of islands (WH and NP islands), or we see a decrease (ADJ islands).

# Taking stock of our results

## Previously reported results:

	Wh-island	Complex NP island	Subject island	Adjunct island
English	Red	Red	Red	Red
Italian	Green	Red	Green	Red
Swedish	Orange	Orange	Orange	Orange
Norwegian	Orange	Orange	Orange	Orange
Arabic	Red	Green	Grey	Red

## Results of the 2x2 definition:

	Wh-island	Complex NP island	Subject island	Adjunct island
English	Red	Red	Red	Red
Italian	Red	Red	Red	Red
Swedish	Red	Red	Red	Red
Norwegian	Red	Red	Red	Red
Arabic	Green	Green	Grey	Orange

# RC-movement in English and Italian

# The current distribution of island effects

Before showing you the results of the experimental approach, it might make sense to first review what the current literature says about island effects with **RC-movement**:

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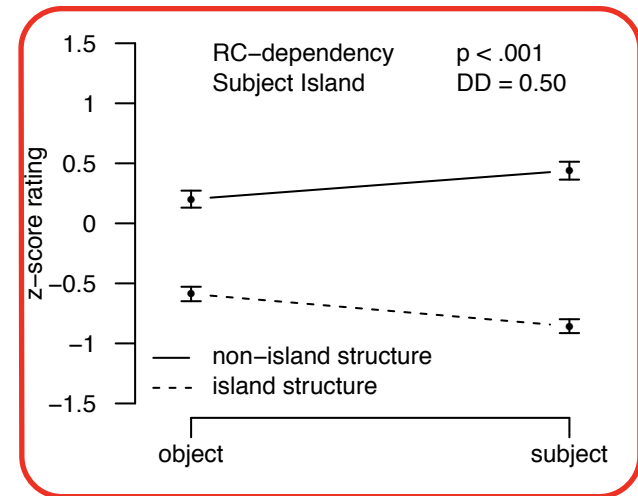
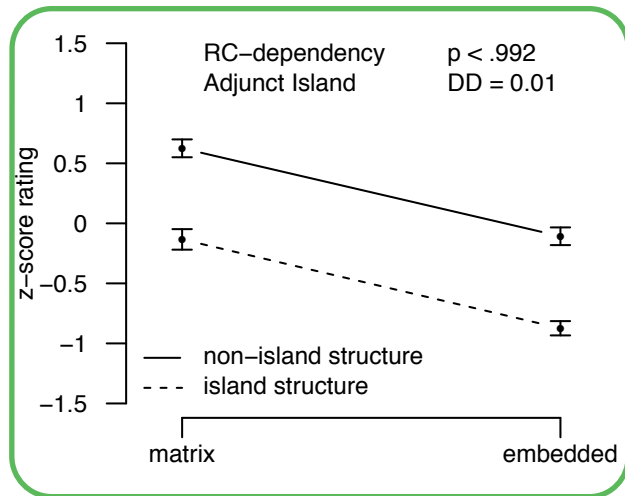
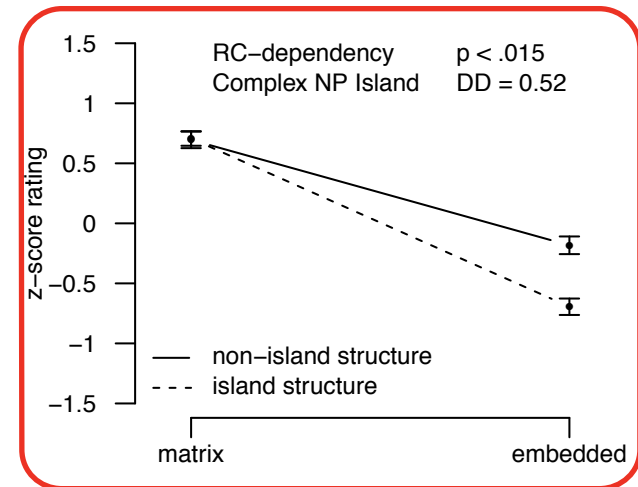
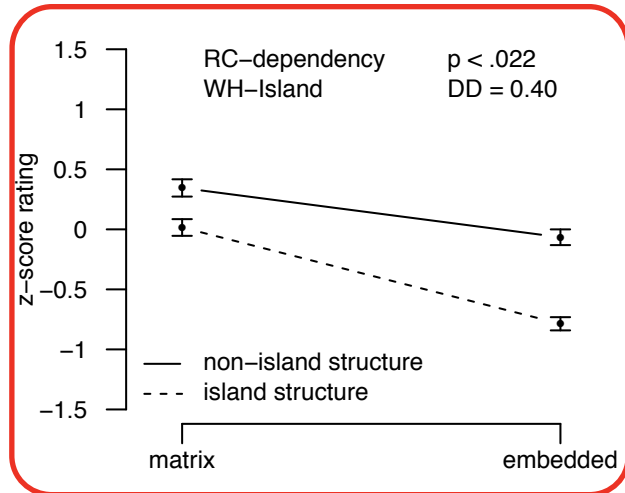
WH-movement is unacceptable.  
Language shows the island constraint



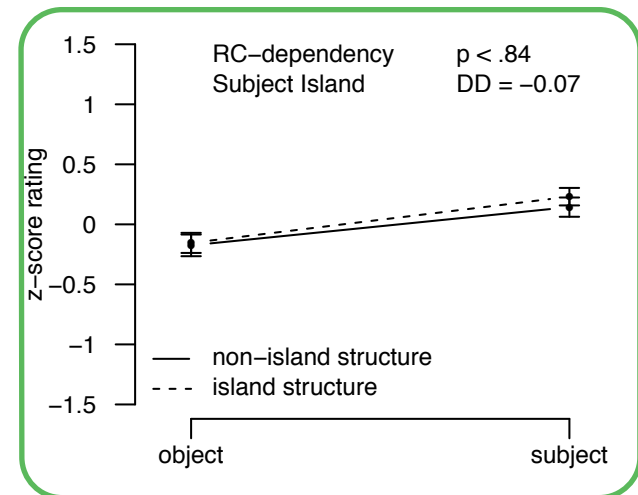
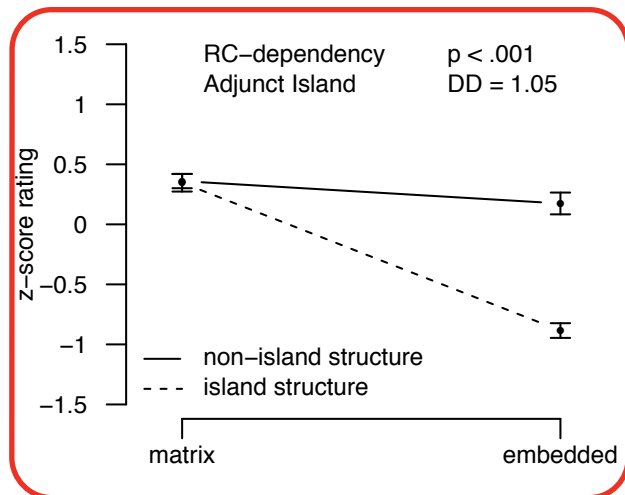
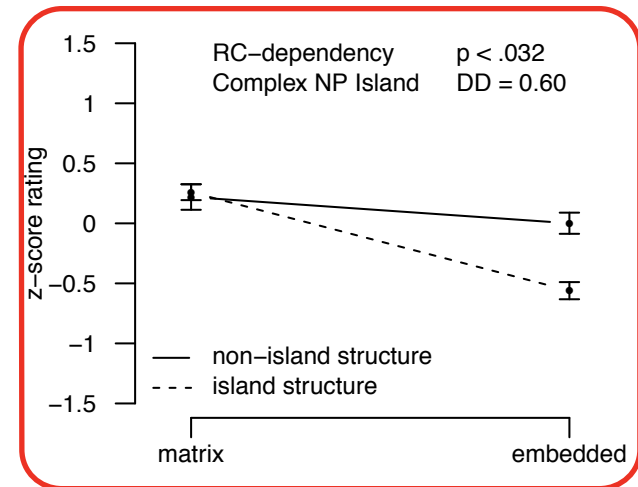
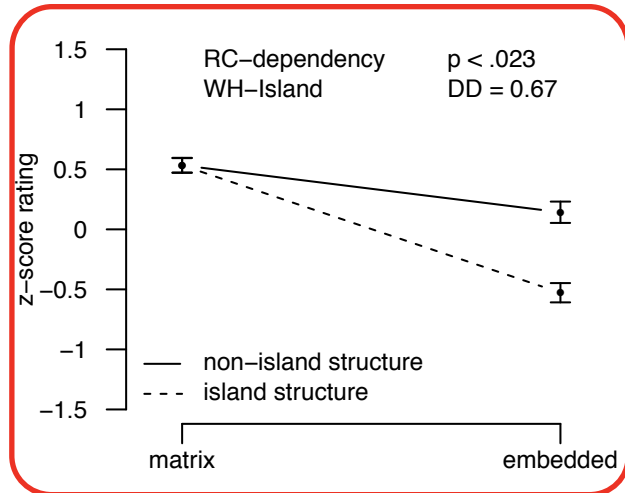
WH-movement is acceptable.  
Language does not show the island constraint

The general idea is that RC-movement and WH-movement should show the same island effects. For English, this has traditionally been assumed to be all of them; for Italian it is only Complex NP and Adjunct islands (Rizzi 1982).

# English RC-movement



# Italian RC-movement





# Taking stock of our results

## Previously reported results:

	Wh-island	Complex NP island	Subject island	Adjunct island
English	Red	Red	Red	Red
Italian	Green	Red	Green	Red

## Results of the 2x2 definition:

	Wh-island	Complex NP island	Subject island	Adjunct island
English	Red	Red	Red	Green
Italian	Red	Red	Green	Red

# WH-in-situ in English and Japanese

# The current distribution of island effects

Before showing you the results of the experimental approach, it might make sense to first review what the current literature says about island effects with **WH-in-situ**:

	Wh-island	Complex NP island	Subject island	Adjunct island
English				
Japanese				



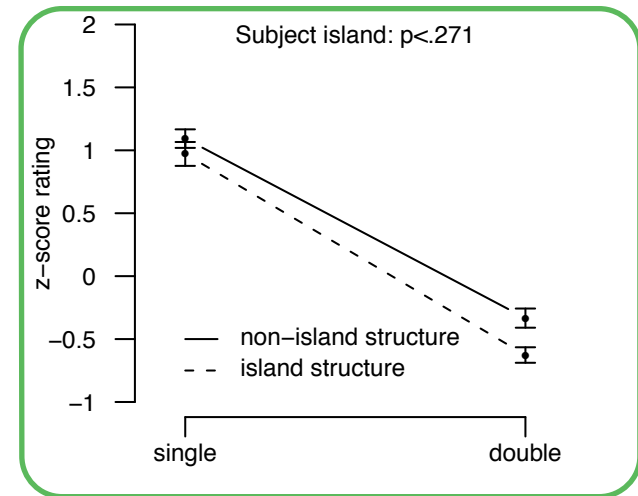
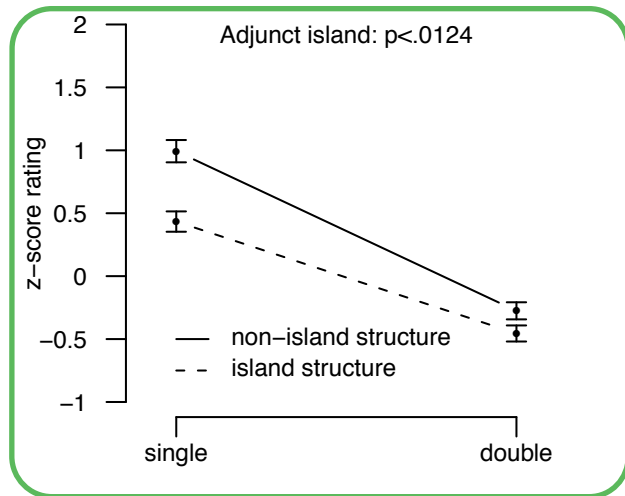
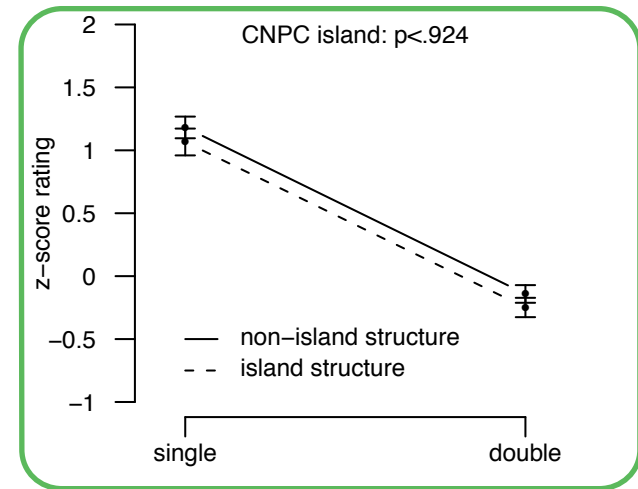
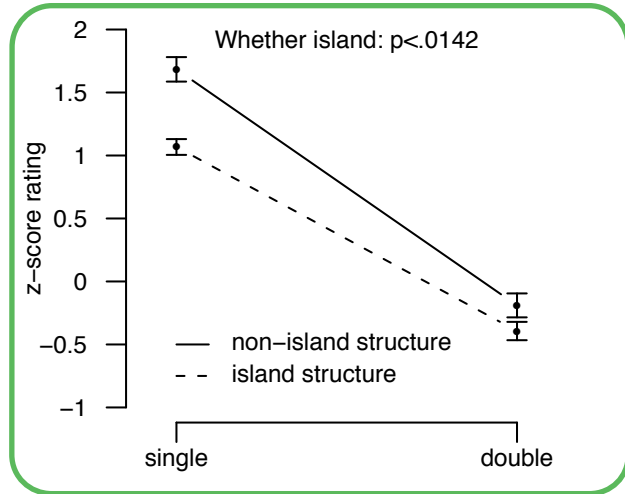
WH-movement is unacceptable.  
Language shows the island constraint



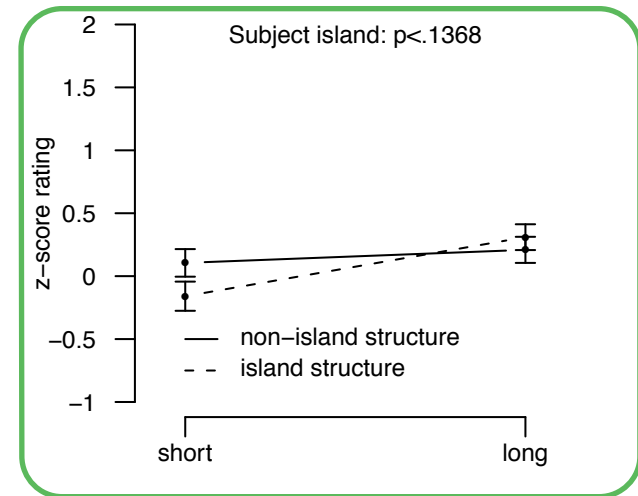
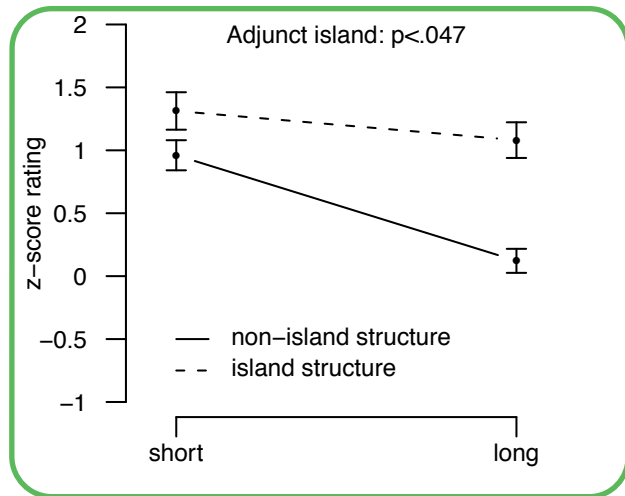
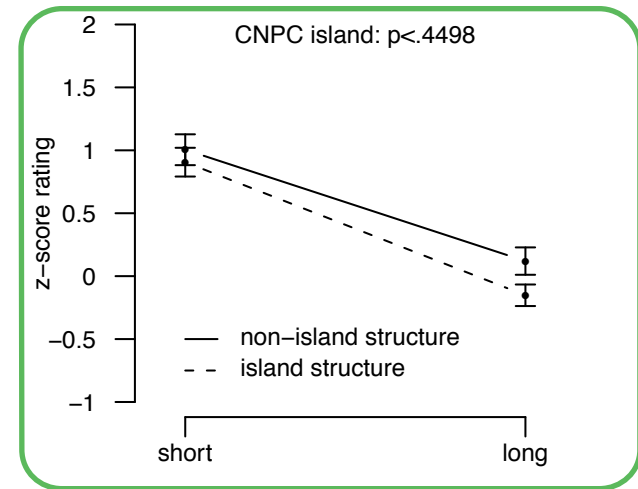
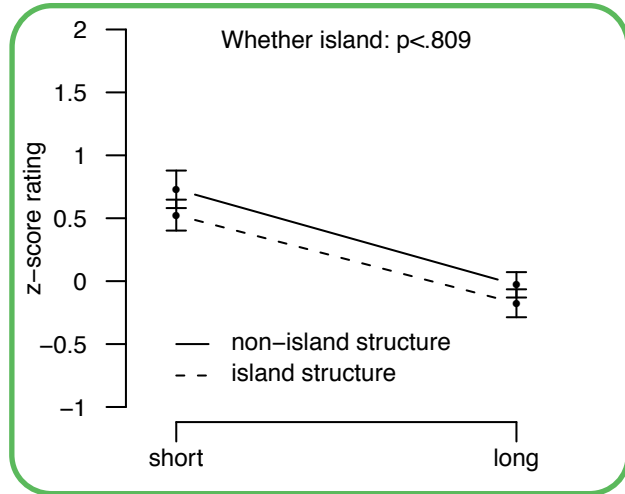
WH-movement is acceptable.  
Language does not show the island constraint

The general idea is that RC-movement and WH-movement should show the same island effects. For English, this has traditionally been assumed to be all of them; for Italian it is only Complex NP and Adjunct islands (Rizzi 1982).

# English WH-in-situ



# Japanese WH-in-situ



# Taking stock of our results

## Previously reported results:

	Wh-island	Complex NP island	Subject island	Adjunct island
English				
Japanese				

## Results of the 2x2 definition:



	Wh-island	Complex NP island	Subject island	Adjunct island
English				
Japanese				

# D-linking in English

# The current distribution of island effects

Before showing you the results of the experimental approach, it might make sense to first review what the current literature says about island effects with **D-linking** (and wh-arguments):

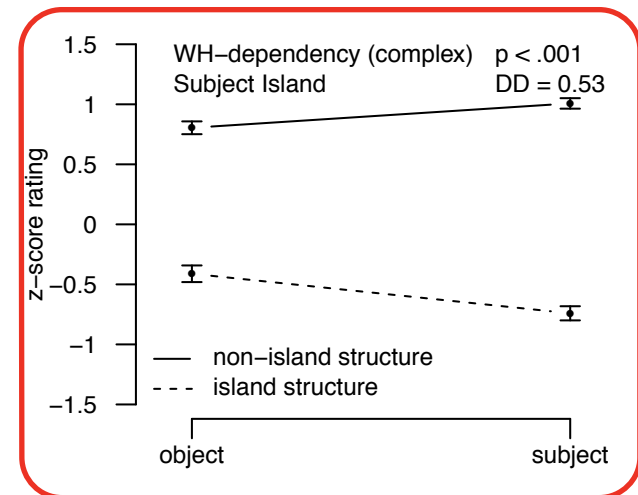
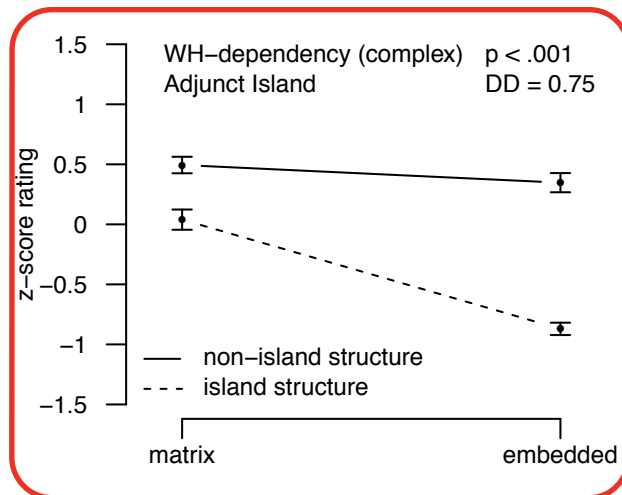
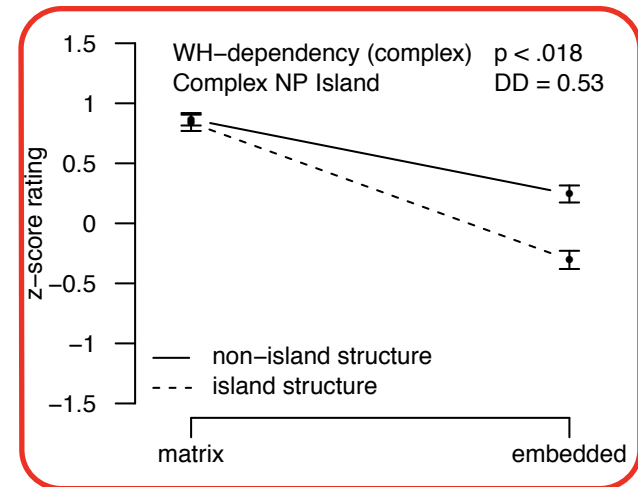
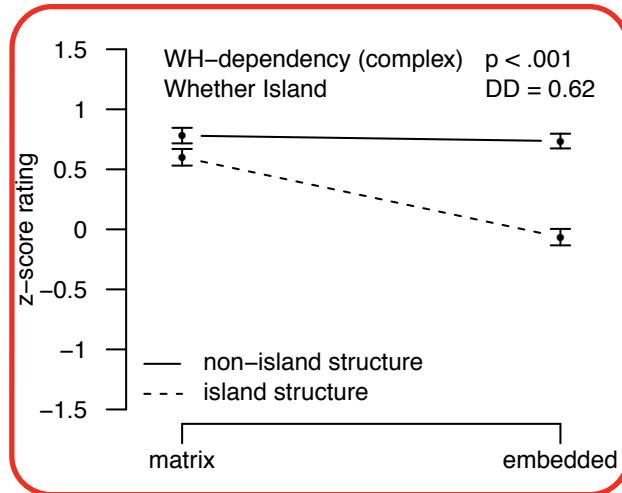
	Wh-island	Complex NP island	Subject island	Adjunct island
English				

-  WH-movement is unacceptable.  
Language shows the island constraint
-  WH-movement is acceptable.  
Language does not show the island constraint

The general idea is that D-linking ameliorates “weak islands”, but not “strong islands”. There is some debate about what exactly constitutes a weak island, but typically wh-islands are thought to be a good exemplar of a weak island. Some may include complex NP islands too.



# English D-linking (and wh-arguments)



# Taking stock of our results

## Previously reported results:

	Wh-island	Complex NP island	Subject island	Adjunct island
English				

## Results of the 2x2 definition:

	Wh-island	Complex NP island	Subject island	Adjunct island
English				

# Theories of island effects

# Putting all of the results together

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red	Red	Red	Red	Red
	rc-move	Red	Red	Red	Red	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green	Green	Green	Green	Green
	d-linking	Green	Orange	Red	Red	Red	Red	Red	Red
Italian	wh-move	Green	Red	Green	Red	Red	Red	Red	Red
	rc-move	Green	Red	Green	Red	Red	Red	Green	Red
Swedish	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Norwegian	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Arabic	wh-move	Red	Green	Grey	Red	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green	Green	Green	Green	Green

Obviously, existing theories are designed to explain the existing data. So they will need to be modified to account for the 2x2 results.

# The Subjacency approach


The guiding idea of the Subjacency approach to island effects is that there are special phrases called **bounding nodes**, and that movement operations **cannot cross 2** (or more) bounding nodes.

Subjacency easily accounts for WH-islands and Subject islands by positing that IP and NP are both bounding nodes:

**Whether:** \* **What** do [IP you wonder [CP whether [IP Jack stole \_\_\_]]]?



**Subject:** \* **What** do you think [CP [IP [NP the necklace for \_\_\_] is pretty]]?




However, it always required additional assumptions to account for NP and ADJ islands, such as saying that the specifier of NP-complement and adjunct CPs can't be landing positions for successive cyclic movement:

**CNPC:** \* **What** do [IP you make the claim [CP that [IP Jack stole \_\_\_]]]?



**Adjunct:** \* **What** do you worry [CP if [IP Jack forgets \_\_\_]]?



# Modifying the Subjacency approach

Language	Type	2x2 Definition			
		WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green
	d-linking	Red	Red	Red	Red
Italian	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Green	Red
Swedish	wh-move	Red	Red	Red	Red
Norwegian	wh-move	Red	Red	Red	Red
Arabic	wh-move	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green

IP and NP are bounding nodes. Landing in ADJ-CP is conditioned by movement type. No landing in NP-CP ever.

Subjacency doesn't hold for covert movement.

Subjacency does hold for d-linking.

IP and NP are bounding nodes, no ADJ/NP-CP.

IP is the bounding node, no ADJ/NP-CP.

IP and NP are bounding nodes, no ADJ/NP-CP.

IP and NP are bounding nodes, no ADJ/NP-CP.

No bounding nodes. No landing in ADJ CP.

Subjacency doesn't hold for covert movement.

The big question is what conditions the availability of ADJ-CP and NP-CP as landing sites. This was always a mystery, but these results show variability

# The Barriers approach


The Barriers approach was an evolution of the Subjacency approach that attempted to (i) correct some empirical problems and (ii) unify the idea of government and bounding nodes.

The basic idea is that some phrasal nodes are barriers to movement (everything except complements and non-finite IP), and that barriers can be circumvented through adjunction. Islands facts thus arise through the interaction of the definition of barriers and constraints on adjunction.

For example, because English shows both Subject and Adjunct islands, it must be the case that adjunction to subjects and adjuncts is prohibited:

**Subject:**

\* **What** do you think [<sub>CP</sub> [<sub>IP</sub> [<sub>NP</sub> the necklace for \_\_\_] is pretty]]?



**Adjunct:**

\* **What** do you worry [<sub>CP</sub> if [<sub>IP</sub> Jack forgets \_\_\_]]?



# Modifying the Barriers approach

Language	Type	2x2 Definition			
		WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green
	d-linking	Red	Red	Red	Red
Italian	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Green	Red
Swedish	wh-move	Red	Red	Red	Red
Norwegian	wh-move	Red	Red	Red	Red
Arabic	wh-move	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green

Adjunction is prohibited everywhere but VP.

Adjunction to adjuncts is allowed.

Subjacency doesn't hold for covert movement.

Subjacency still hold for d-linking.

Adjunction is prohibited everywhere but VP.

Adjunction to subjects is allowed.

Adjunction is prohibited everywhere but VP.

Adjunction is prohibited everywhere but VP.

Adjunction is allowed everywhere.

Subjacency doesn't hold for covert movement.

This new data simplifies the Barriers approach by localizing all of the variation in adjunction (no variation in Barrierhood). Chomsky 1986 had to postulate

some variation in Barrierhood to account for the lack of wh-islands in Italian.



# The Phases approach

The Phases approach is in many ways a minimalistic evolution of the Subjacency/Barriers approach, as it continues to posit certain structures (called phases) that constrain displacement.

The major advance of the Phases approach is that it attempts to define these special structures by more than just their transparency to displacement, and tie those structures to a deep property of the grammatical architecture (e.g., cyclic Spell-Out).

There is currently much debate about how best to define phases, so I won't review that here, but the basic idea is that any structure that forms an island must also be (or contain) a phase, and that movement to the edge of the phase (the escape hatch of the phase) must be impossible.

This works really well for islands like wh-islands, which appear to have an element sitting in the edge of the phase:

**Whether:** \* **What** do [<sub>IP</sub> you wonder [<sub>CP</sub> **whether** [<sub>IP</sub> **Jack stole** \_\_\_]]]? 

This works less well for Subject and Adjunct islands, but see Müller 2010 for an extension of this system that attempts to capture these islands

# Modifying the Phases approach

Language	Type	2x2 Definition			
		WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green
	d-linking	Red	Red	Red	Red
Italian	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Green	Red
Swedish	wh-move	Red	Red	Red	Red
Norwegian	wh-move	Red	Red	Red	Red
Arabic	wh-move	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green

It is relatively straightforward to modify the phases approach to capture this data, as each island effect suggests the presence of a phase.

The real question is whether there are independent criteria that can be used to identify the same phases.

For example, most phase theories would tend to treat subjects and adjuncts identically regardless of the dependency-type.

But our results show that subjects and adjuncts behave differently in wh-movement and rd-movement dependencies.

# CED/Structure-building theories

Language	Type	2x2 Definition			
		WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green
	d-linking	Red	Red	Red	Red
Italian	wh-move	Red	Red	Red	Red
	rc-move	Red	Red	Green	Red
Swedish	wh-move	Red	Red	Red	Red
Norwegian	wh-move	Red	Red	Red	Red
Arabic	wh-move	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green

There are additional theories of island effects that only attempt to explain a subset of the island types.

For example, the CED and its modern descendants attempt to explain SUB and ADJ islands by positing a complement/non-complement asymmetry, either in terms of government (the CED), or in terms of how the structures are built (e.g., a second syntactic workspace).

Once again, these theories would need to be modified such that subjects and adjuncts are not always islands.

# Some simplification, some complication

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red	Red	Red	Red	Red
	rc-move	Red	Red	Red	Red	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green	Green	Green	Green	Green
	d-linking	Green	Orange	Red	Red	Red	Red	Red	Red
Italian	wh-move	Green	Red	Green	Red	Red	Red	Red	Red
	rc-move	Green	Red	Green	Red	Red	Red	Green	Red
Swedish	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Norwegian	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Arabic	wh-move	Red	Green	Grey	Red	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green	Green	Green	Green	Green

The bottom line is that these results appear to simplify some aspects of the theory of islands, particularly with respect to variation between English, Italian, and Scandinavian (contra the literature of the early 1980s).

But these results also complicate other aspects of the theory, particularly with respect to variation **within a single language**. English and Italian show that adjuncts and subjects (respectively) can show variable island-status within a single language.

# Exceptions to island effects in English

# What are exceptions?

Before concluding this first-pass tour of the empirical landscape of islands, I would like to talk about a class of facts that appear to be **exceptions** to the classic structural formulation of island constraints.

These facts are all united by the same property: going by structural definition alone, these should all be island effects; however, various authors have claimed that these **do not show the expected island effect**.

**Non-finiteness** (Chomsky 1986):

**What** do you wonder [<sub>WH</sub> how to fix  $t_{\text{what}}$   $t_{\text{how}}$  ]?

**Which symphony** did Schubert die [<sub>ADJ</sub> before finishing \_\_\_ ]?

**NP recursion** (Deane 1991):

**Which laws** do you advocate [<sub>NP</sub> an end to [<sub>NP</sub> the enforcement of \_\_\_ ] ]?

**Event-relatedness** (Truswell 2007):

**What** did John arrive [<sub>ADJ</sub> quoting \_\_\_ ]?

# The Non-finiteness exception is real

## Non-finite WH-island:

Who \_\_\_ wants to fix the car?

What do you want to fix \_\_\_?

Who \_\_\_ wonders how to fix the car?

\* What do you wonder [how to fix \_\_\_]?

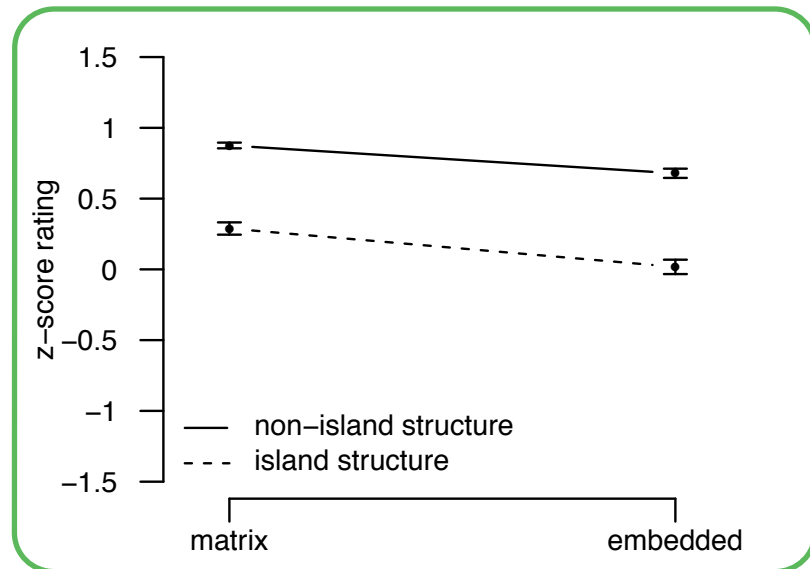
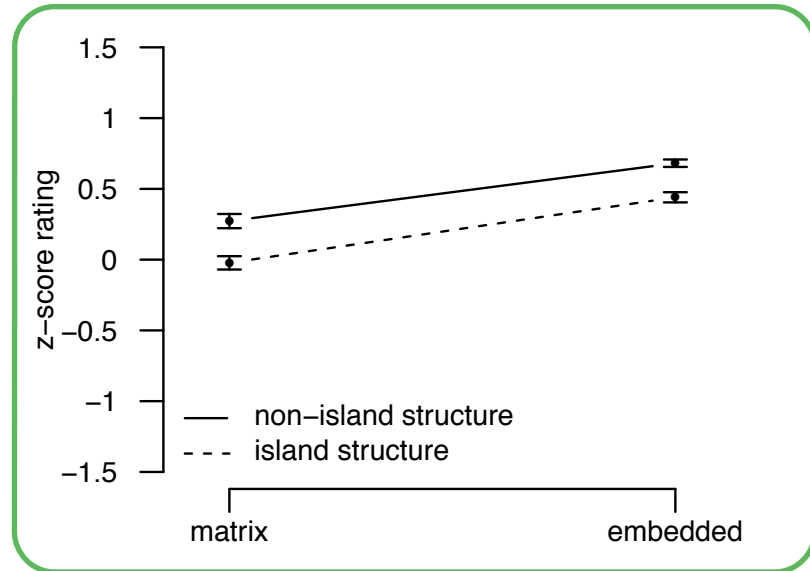
## Non-finite Adjunct island:

Which composer \_\_\_ finished the symphony?

Which symphony did the composer finish \_\_\_?

Which composer \_\_\_ died before finishing the symphony?

\* Which symphony did the composer die [before finishing \_\_\_]?



# The NP recursion exception is not

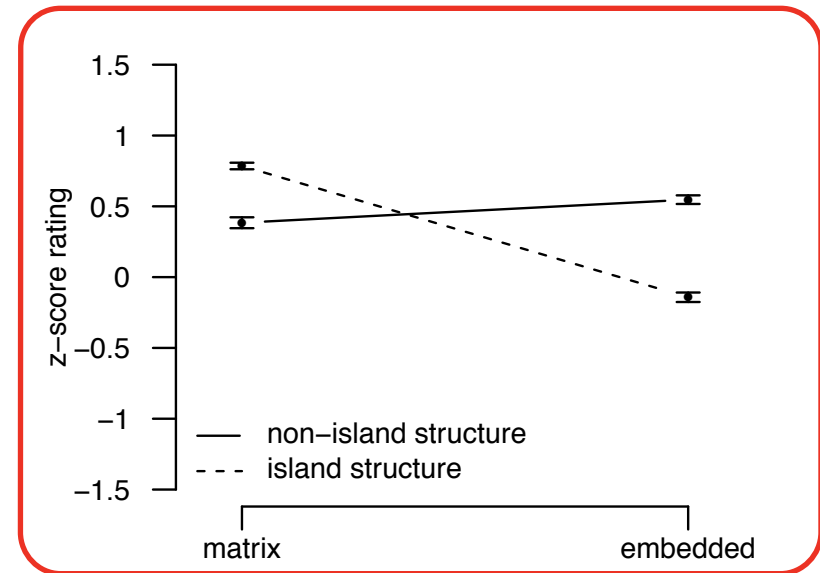
## NP recursion:

Who \_\_\_ advocates an end to drug laws?

Which laws do you advocate an end to \_\_\_?

Who \_\_\_ advocates an end to the enforcement of drug laws?

\*Which laws do you advocate [an end to [the enforcement of \_\_\_]]?





# The Event-relatedness exception may not exist either

## Unaccusatives:

Who \_\_\_ quoted the play?

What did John quote \_\_\_?

Who \_\_\_ arrived quoting the play?

\* What did John arrive [quoting \_\_\_]?

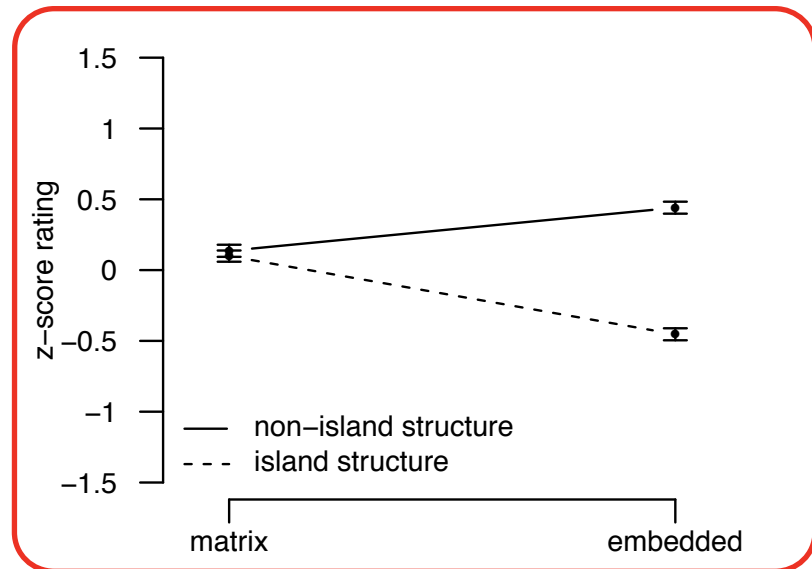
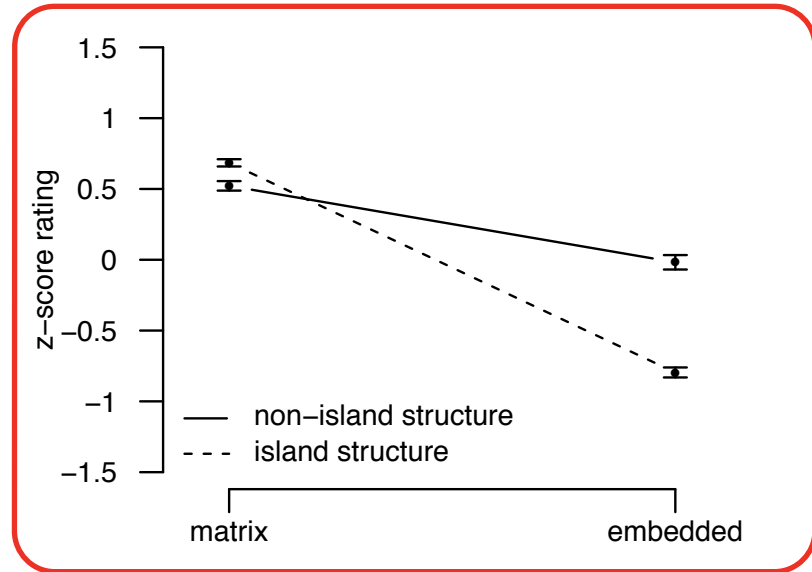
## Reflexives:

Who \_\_\_ carved a pumpkin?

What did Mike carve \_\_\_?

Who \_\_\_ cut himself carving a pumpkin?

\* What did Mike cut himself [carving \_\_\_]?



# Non-finiteness is the only exception

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red	Red	Red	Red	Red
	rc-move	Red	Red	Red	Red	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green	Green	Green	Green	Green
	d-linking	Green	Orange	Red	Red	Red	Red	Red	Red
Italian	wh-move	Green	Red	Green	Red	Red	Red	Red	Red
	rc-move	Green	Red	Green	Red	Red	Red	Green	Red
Swedish	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Norwegian	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Arabic	wh-move	Red	Green	Grey	Red	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green	Green	Green	Green	Green
Exceptions	non-finite	Green	Grey	Grey	Green	Green	Grey	Grey	Green
	np recurs	Grey	Green	Grey	Grey	Grey	Red	Grey	Grey
	events	Grey	Grey	Grey	Green	Grey	Grey	Grey	Red

At least from the small set of exceptions that I've tested, it looks like non-finiteness is the only exception. This means that the theory of islands must incorporate finiteness as a necessary condition for wh-islands and adjunct islands. But NP-recursion and event-relatedness are no longer concerns.

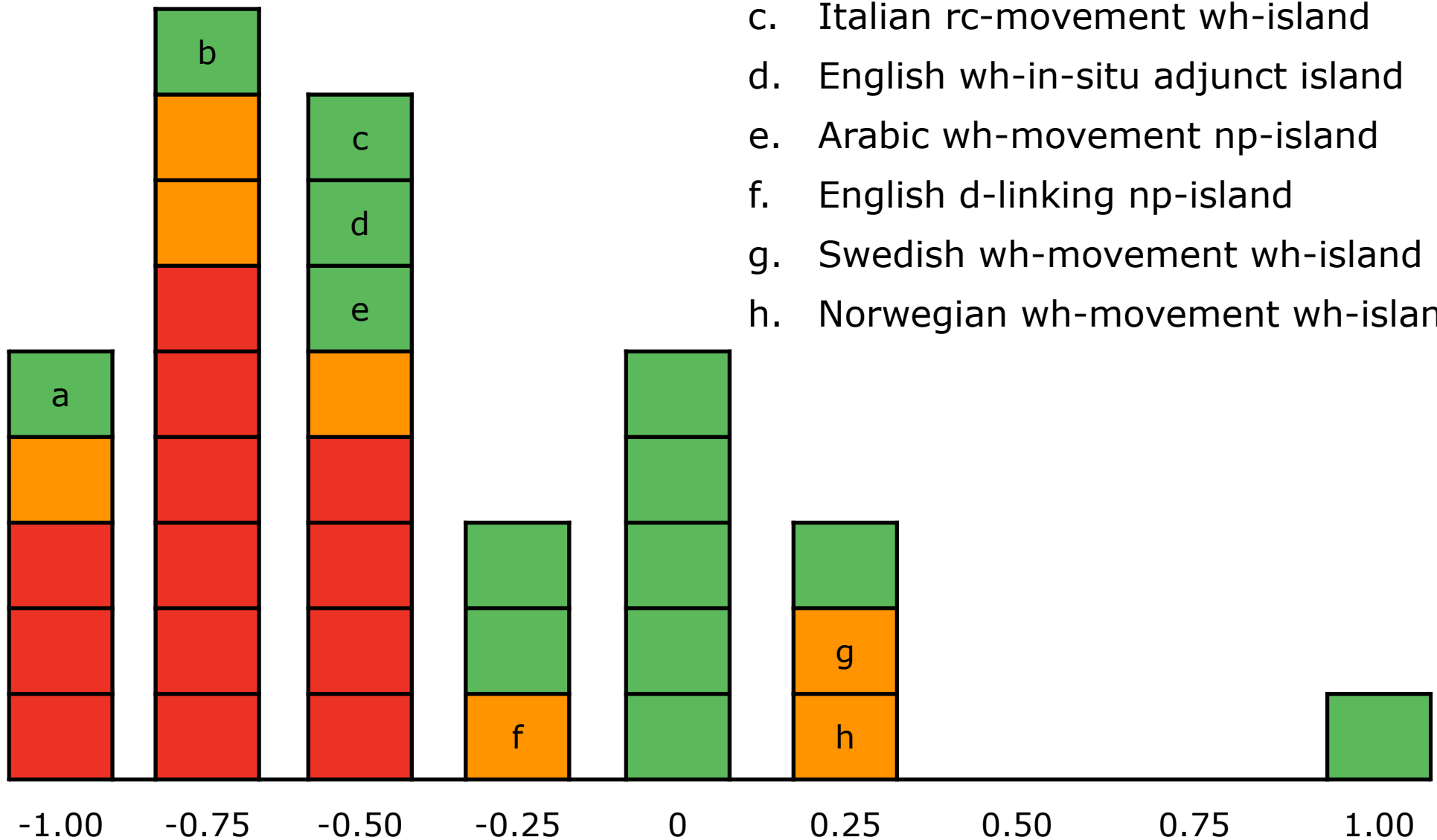
Were the informal results bad?  
Or were they just not asking the reductionist  
question?

# We can look at the rating of the violation versus the informal conclusion

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move	-0.50	-0.75		-1.00				
	rc-move	-0.75	-0.75		-0.75				
	in-situ	-0.25	-0.25		-0.50				
	d-linking	0	-0.25		-0.75				
Italian	wh-move	-1.00	-1.00		-1.00				
	rc-move	-0.50	-0.50		-0.75				
Swedish	wh-move	0.25	-1.00		-0.50				
Norwegian	wh-move	0.25	-0.75		-0.75				
Arabic	wh-move	-0.50	-0.50		-0.50				
Japanese	in-situ	0	0		1.00				
Exceptions	non-finite	0.25			0				
	np recurs		0						
	events				-0.75				

# We can look at the rating of the violation versus the informal conclusion

- a. Italian wh-movement wh-island
- b. English event-related adjunct island
- c. Italian rc-movement wh-island
- d. English wh-in-situ adjunct island
- e. Arabic wh-movement np-island
- f. English d-linking np-island
- g. Swedish wh-movement wh-island
- h. Norwegian wh-movement wh-island



For those of you interested in sluicing

# Sluicing and the 2x2 design

Just for fun a couple of years ago I tried creating a 2x2 design for sluicing and island effects:

Someone thinks that Paul stole the necklace,  
but I don't know **who** \_\_\_ ~~thinks that Paul stole the necklace~~.

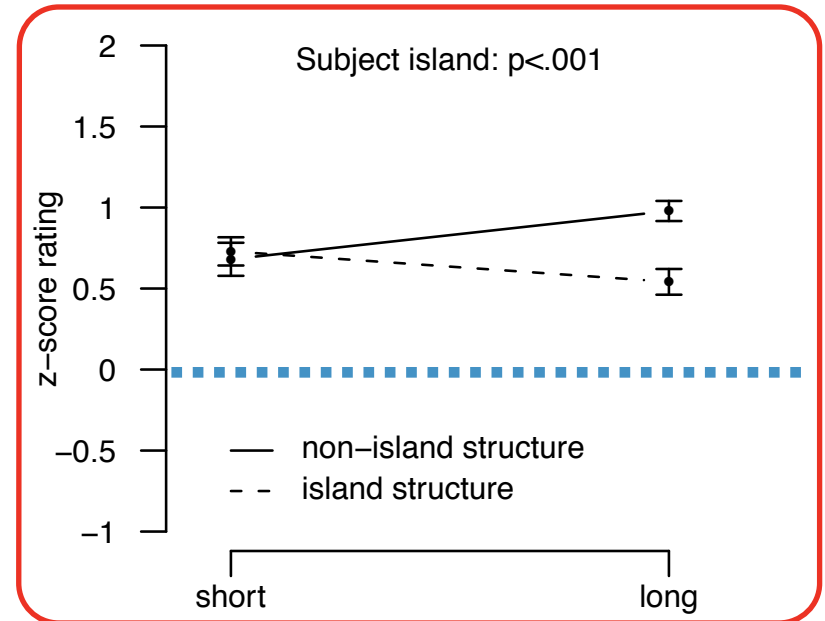
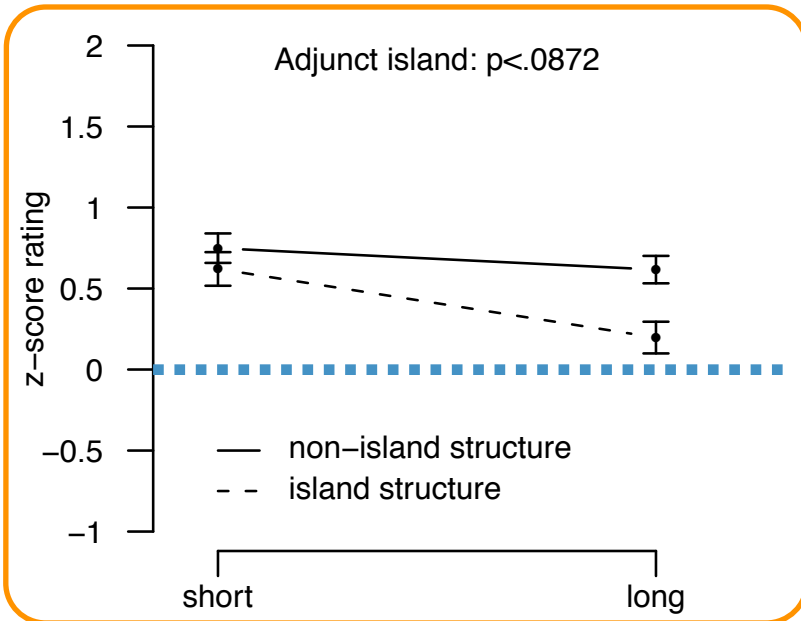
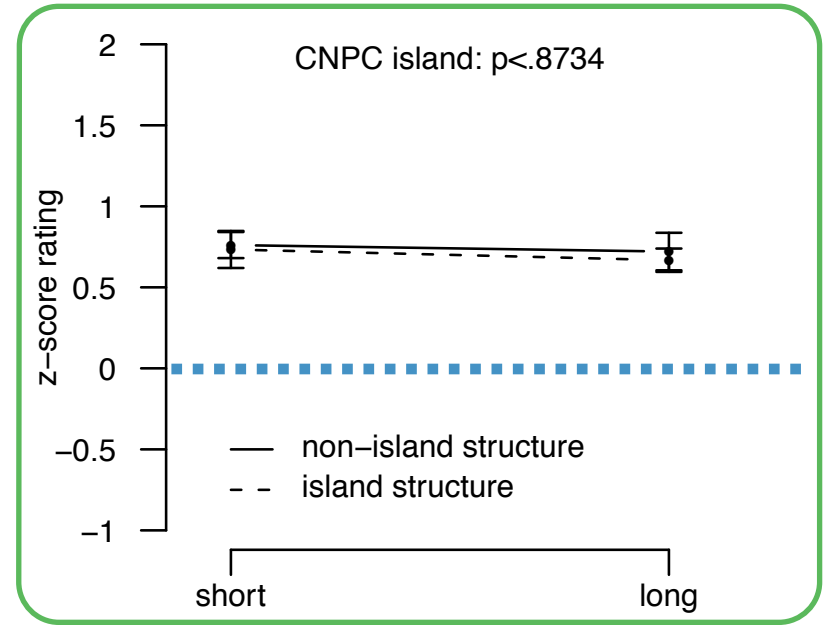
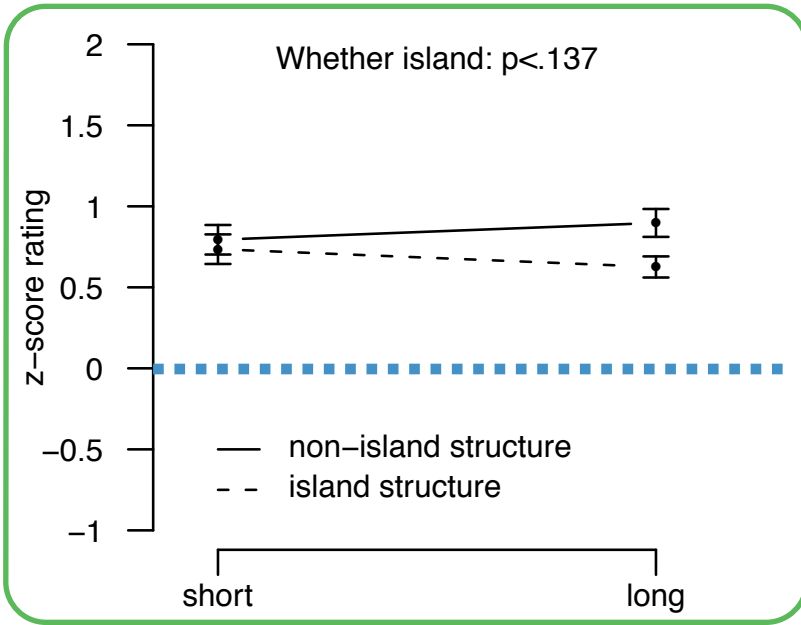
The detective thought that Paul stole something,  
but I don't know **what** ~~the detective thought that Paul stole~~ \_\_\_.

Someone wonders whether Paul stole the necklace,  
but I don't know **who** \_\_\_ ~~wonders [whether Paul stole the necklace]~~.

The detective wonders whether Paul stole something,  
but I don't know **what** ~~the detective wonders [whether Paul stole~~ \_\_\_].

You can use the same paradigm for the other three island types under discussion today (NP, SUB, and ADJ).

# Sluicing and the 2x2 design





Some misalignments of the presence/absence  
of a constraint, and raw acceptability

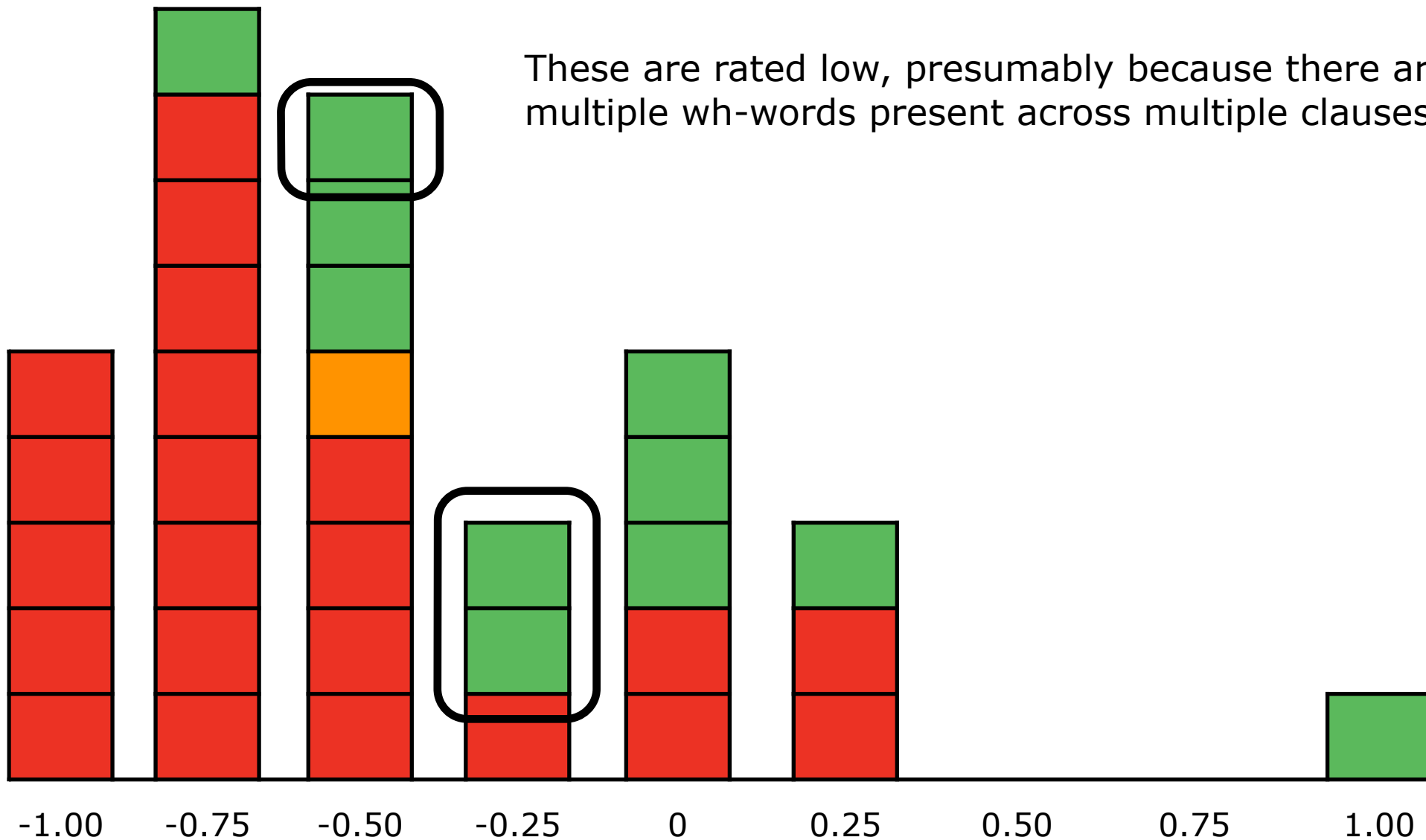
To see misalignments, we look at the rating of the violation versus the 2x2 conclusion

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move					-0.50	-0.75		-1.00
	rc-move					-0.75	-0.75		-0.75
	in-situ					-0.25	-0.25		-0.50
	d-linking					0	-0.25		-0.75
Italian	wh-move					-1.00	-1.00		-1.00
	rc-move					-0.50	-0.50		-0.75
Swedish	wh-move					0.25	-1.00		-0.50
Norwegian	wh-move					0.25	-0.75		-0.75
Arabic	wh-move					-0.50	-0.50		-0.50
Japanese	in-situ					0	0		1.00
Exceptions	non-finite					0.25			0
	np recurs						0		
	events								-0.75

# The rating of the violation versus the 2x2 design

These are the English wh-in-situ islands.

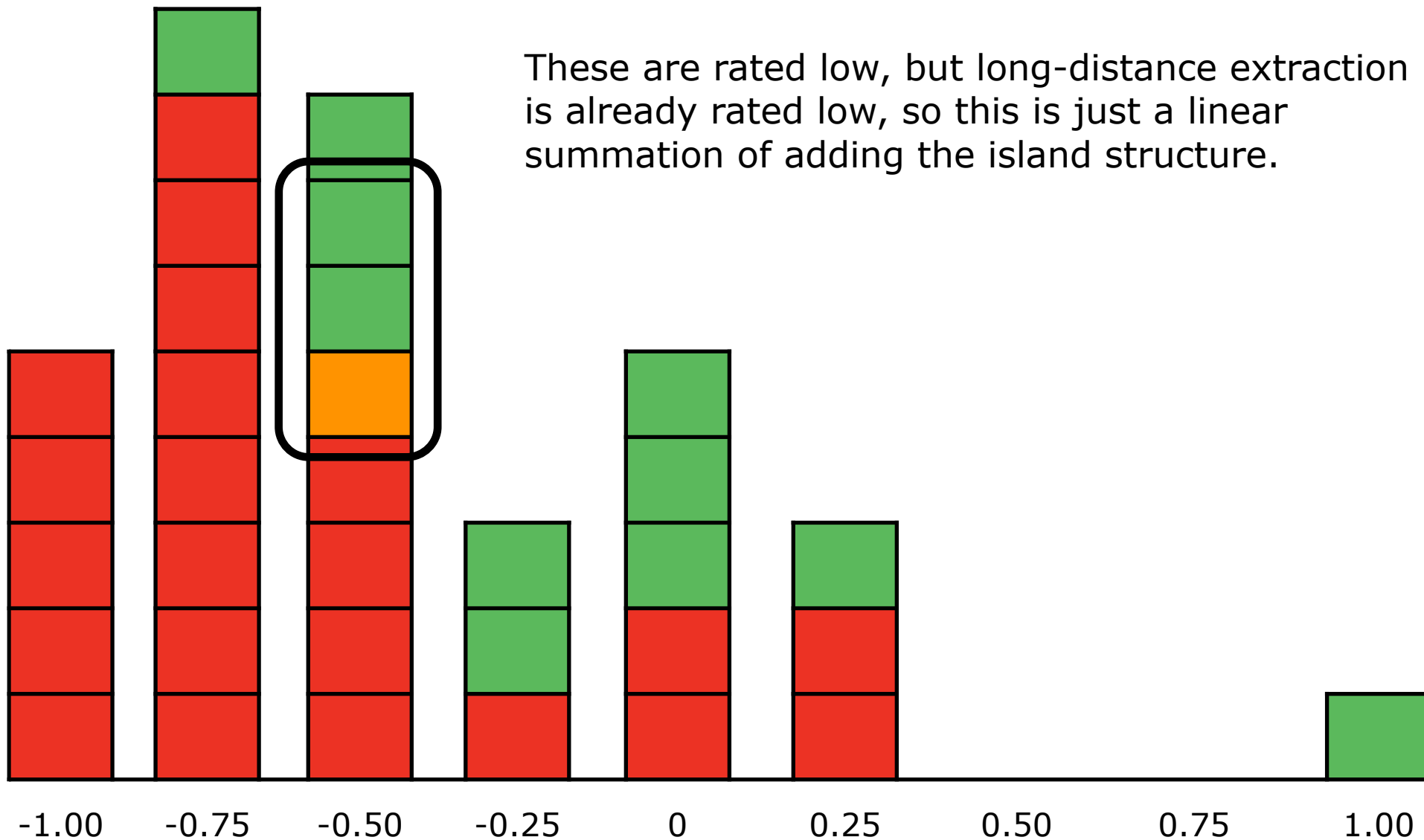
These are rated low, presumably because there are multiple wh-words present across multiple clauses.



# The rating of the violation versus the 2x2 design

These are the Arabic islands.

These are rated low, but long-distance extraction is already rated low, so this is just a linear summation of adding the island structure.

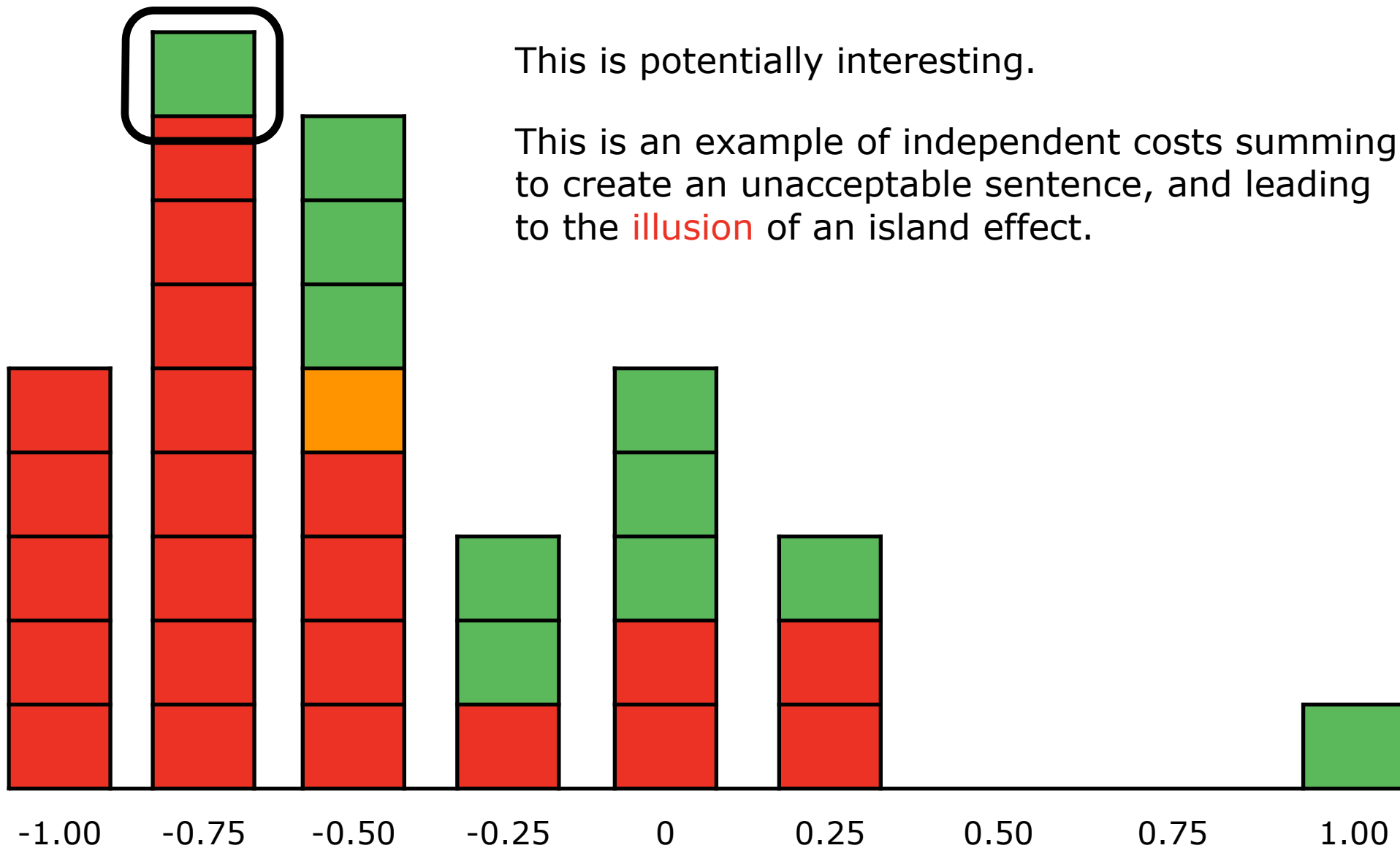


# The rating of the violation versus the 2x2 design

This is the English RC-movement Adjunct island.

This is potentially interesting.

This is an example of independent costs summing to create an unacceptable sentence, and leading to the **illusion** of an island effect.



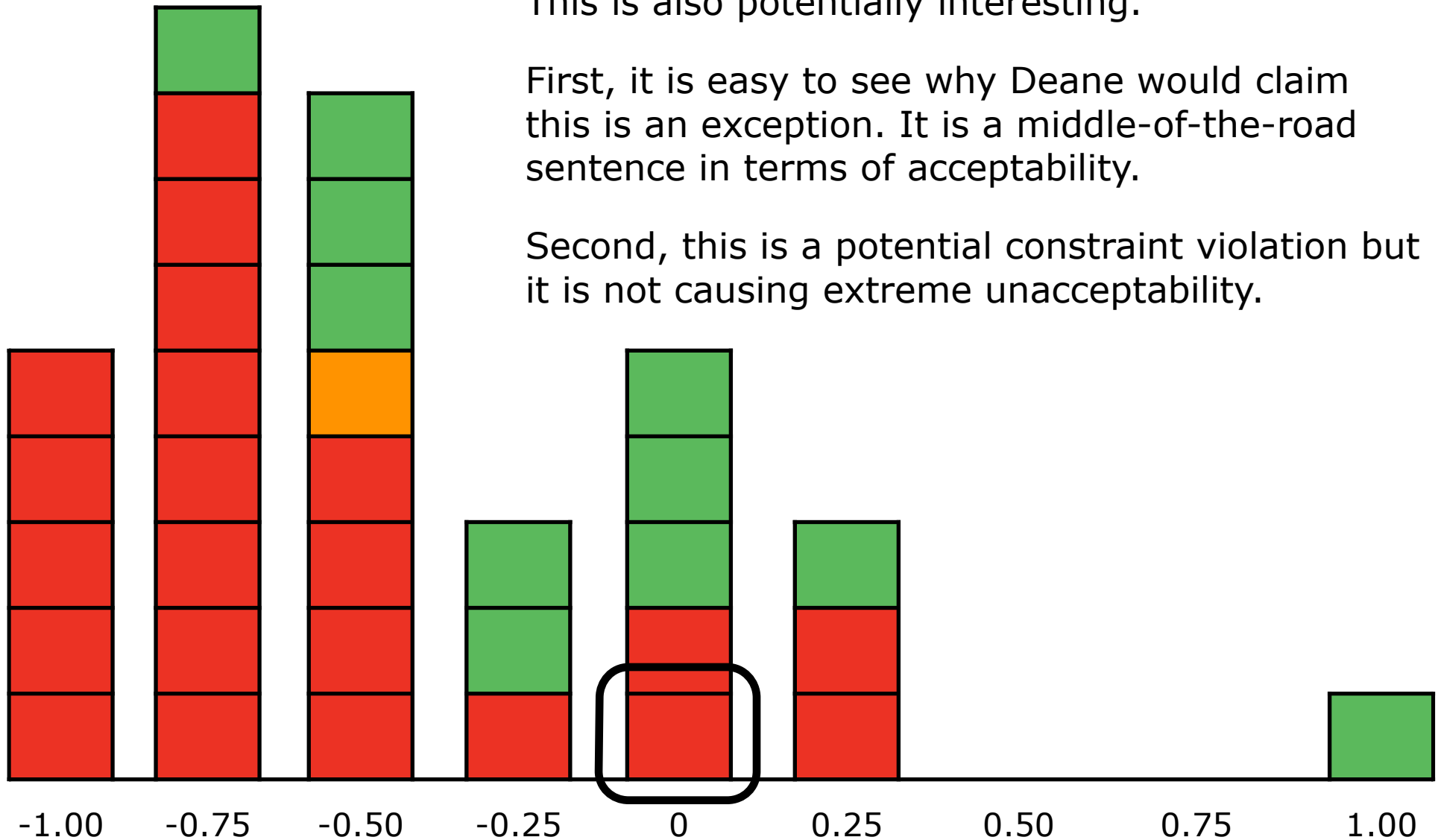
# The rating of the violation versus the 2x2 design

This is the English NP-recursion exception.

This is also potentially interesting.

First, it is easy to see why Deane would claim this is an exception. It is a middle-of-the-road sentence in terms of acceptability.

Second, this is a potential constraint violation but it is not causing extreme unacceptability.



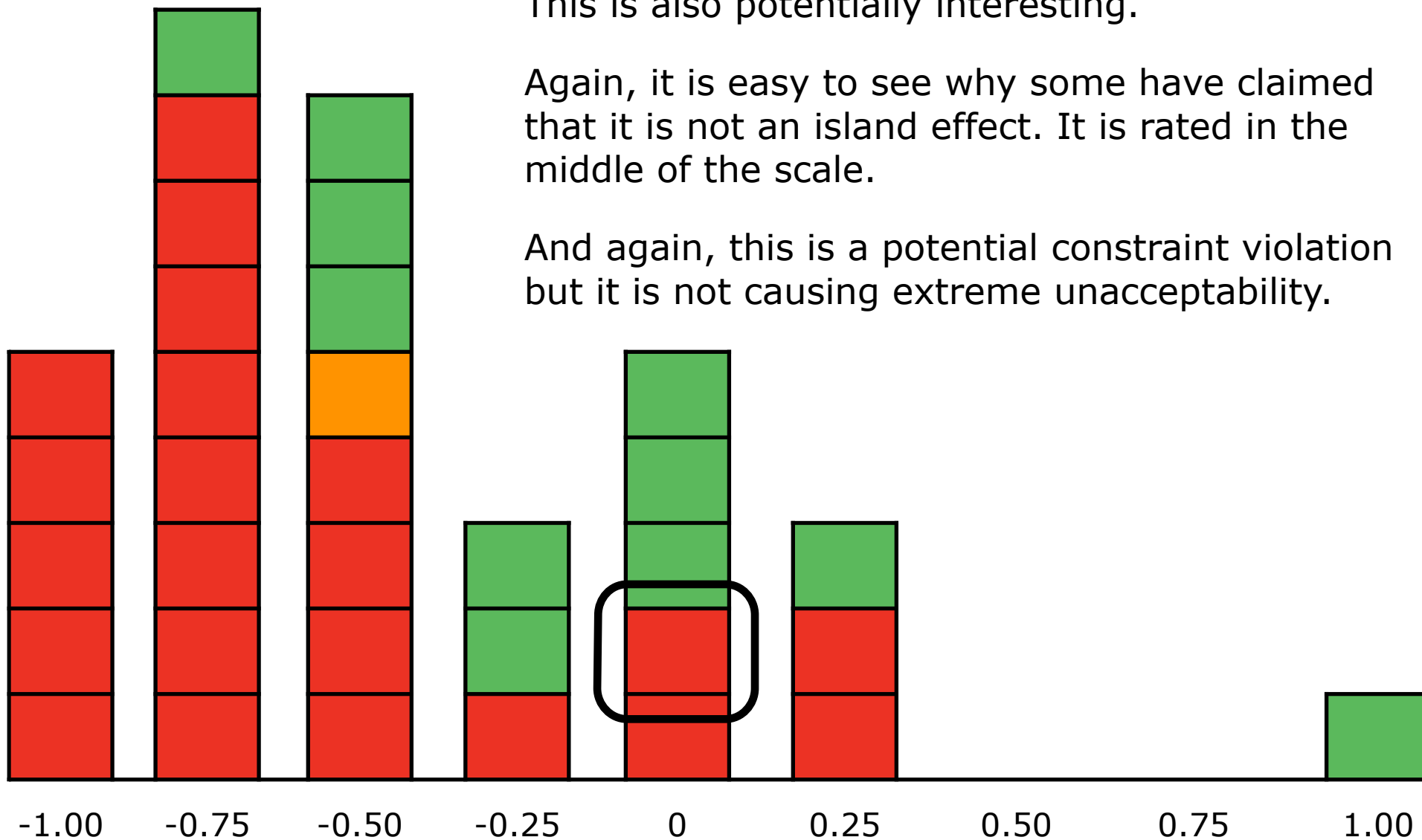
# The rating of the violation versus the 2x2 design

This is the English D-linking WH-island.

This is also potentially interesting.

Again, it is easy to see why some have claimed that it is not an island effect. It is rated in the middle of the scale.

And again, this is a potential constraint violation but it is not causing extreme unacceptability.



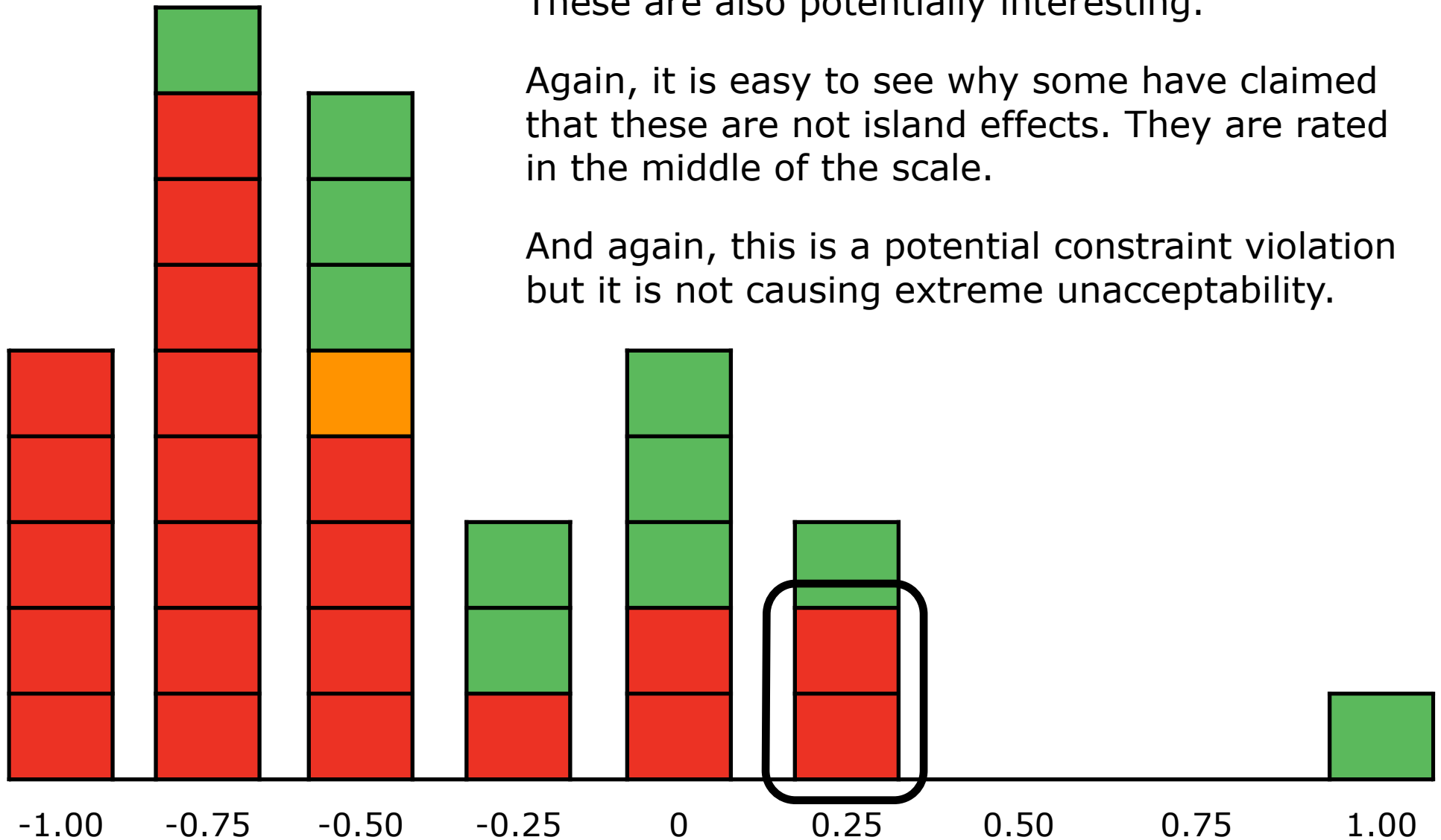
# The rating of the violation versus the 2x2 design

These are the Swedish and Norwegian WH-islands.

These are also potentially interesting.

Again, it is easy to see why some have claimed that these are not island effects. They are rated in the middle of the scale.

And again, this is a potential constraint violation but it is not causing extreme unacceptability.





# Four possible alignments

In many ways, what we are doing is looking at two factors: raw unacceptability of the violation and superadditivity in the 2x2 design. Each of these factors has two values: high/low acceptability and presence/absence of superadditivity. So there are four possible alignments:

<b>Raw Acceptability</b>	<b>2x2 Superadditivity</b>	<b>Interpretation</b>
high	absent	No island constraint
low	present	Island constraint
high	present	Island constraint that does not lower acceptability too much
low	absent	No island constraint, but the illusion of one

# These are the canonical alignments

In many ways, what we are doing is looking at two factors: raw unacceptability of the violation and superadditivity in the 2x2 design. Each of these factors has two values: high/low acceptability and presence/absence of superadditivity. So there are four possible alignments:

<b>Raw Acceptability</b>	<b>2x2 Superadditivity</b>	<b>Interpretation</b>
high	absent	No island constraint
low	present	Island constraint
high	present	Island constraint that does not lower acceptability too much
low	absent	No island constraint, but the illusion of one

# And this is an illusion that is predicted by sentence processing

In many ways, what we are doing is looking at two factors: raw unacceptability of the violation and superadditivity in the 2x2 design. Each of these factors has two values: high/low acceptability and presence/absence of superadditivity. So there are four possible alignments:

<b>Raw Acceptability</b>	<b>2x2 Superadditivity</b>	<b>Interpretation</b>
high	absent	No island constraint
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low	absent	No island constraint, but the illusion of one

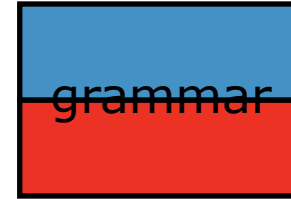
# But what do we make of this?

In many ways, what we are doing is looking at two factors: raw unacceptability of the violation and superadditivity in the 2x2 design. Each of these factors has two values: high/low acceptability and presence/absence of superadditivity. So there are four possible alignments:

<b>Raw Acceptability</b>	<b>2x2 Superadditivity</b>	<b>Interpretation</b>
high	absent	No island constraint
low	present	Island constraint
high	present	Island constraint that does not lower acceptability too much
low	absent	No island constraint, but the illusion of one

# Binary versus Gradient Grammars

I think results like this force us to think carefully about the pros and cons of the two different grammar architectures.



<b>Raw Acceptability</b>	<b>2x2 Superadditivity</b>	<b>Interpretation</b>
high	absent	No island constraint
low	present	Island constraint
high	present	Island constraint that does not lower acceptability too much
low	absent	No island constraint, but the illusion of one

# Binary and Gradient Grammars

# The fact: acceptability is continuous

Acceptability judgments can be reported on a continuous scale. This property, sometimes called **gradience**, can be seen by plotting the acceptability of a random sample of sentence types in ascending order.

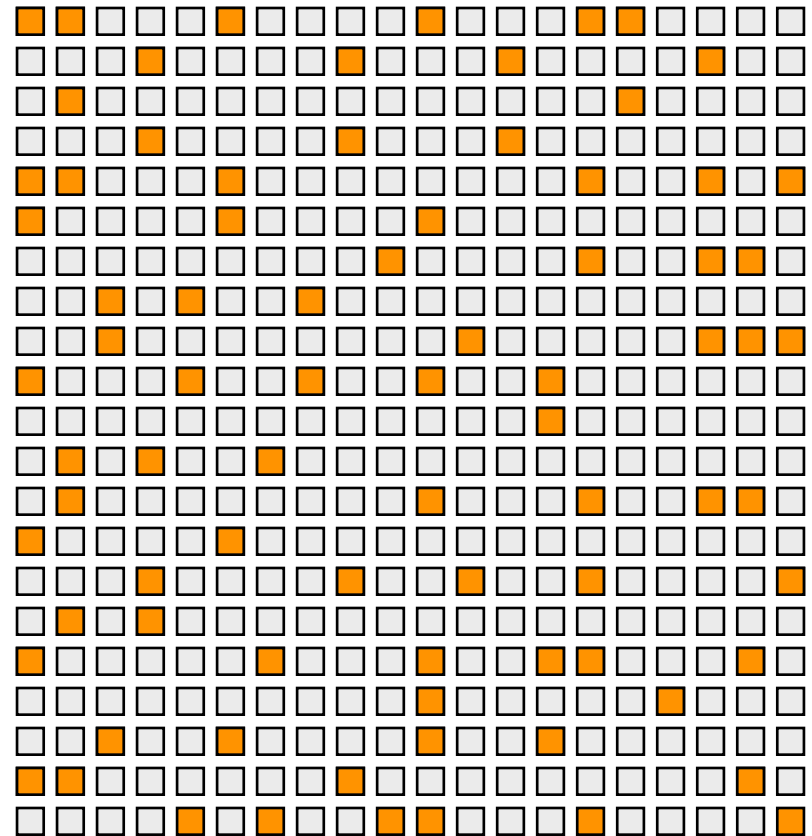
**Step 1:** Randomly select 300 sentence types from [Linguistic Inquiry](#) 2001-2010.



**2001-  
2010**

There were 1740 English syntax data points in LI between 2001-2010.

**Step 2:** Create judgment experiments on Mechanical Turk to test the rating of each sentence.



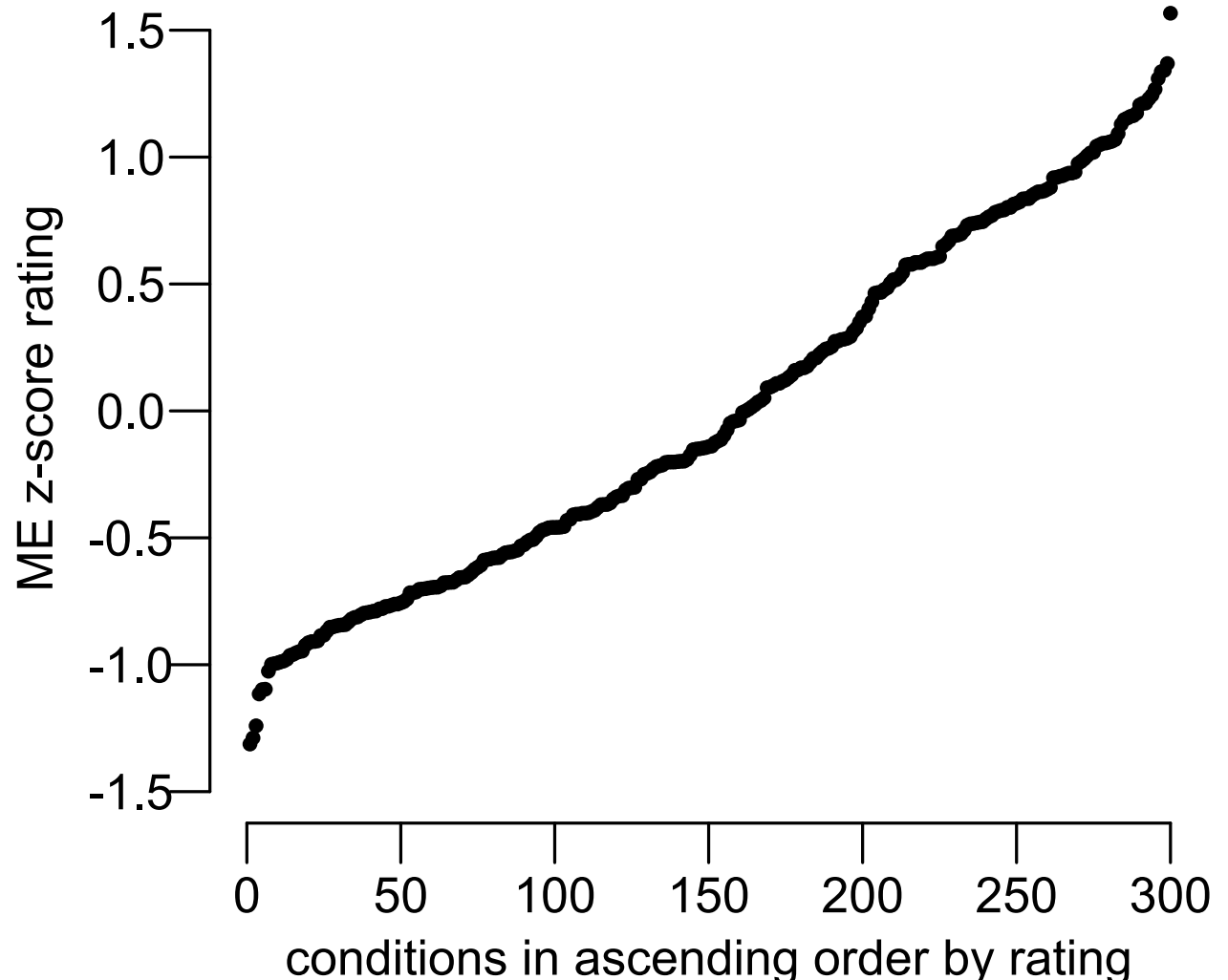
# The fact: acceptability is continuous

Acceptability judgments can be reported on a continuous scale. This property, sometimes called **gradience**, can be seen by plotting the acceptability of a random sample of sentence types in ascending order.

**Step 3:** Plot the mean rating of each data point in order from least to greatest.

Plotted like this, it is easy to see that the sentence types are relatively even distributed along the infinite range of acceptability.

Basically, **every possible level** of acceptability is represented.

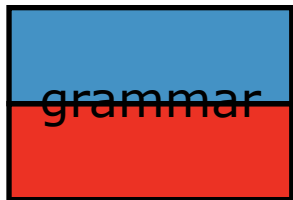




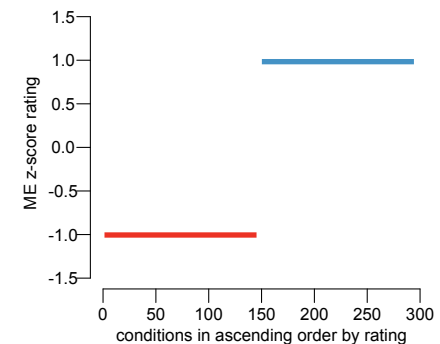
# A common (but **false**) claim: Binary grammars can't explain gradience

It is not uncommon to encounter a claim like the following:

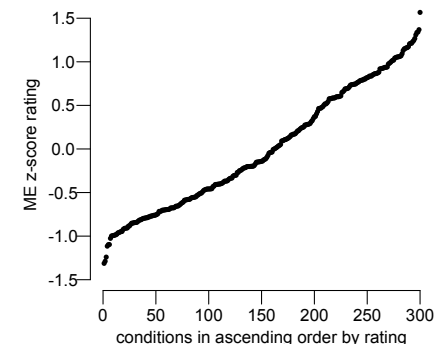
*The fact that acceptability is gradient suggests that grammars must be gradient too. Otherwise, we wouldn't expect gradient acceptability.*



Binary categorical grammars separate sentences into two types: **possible** and **impossible**



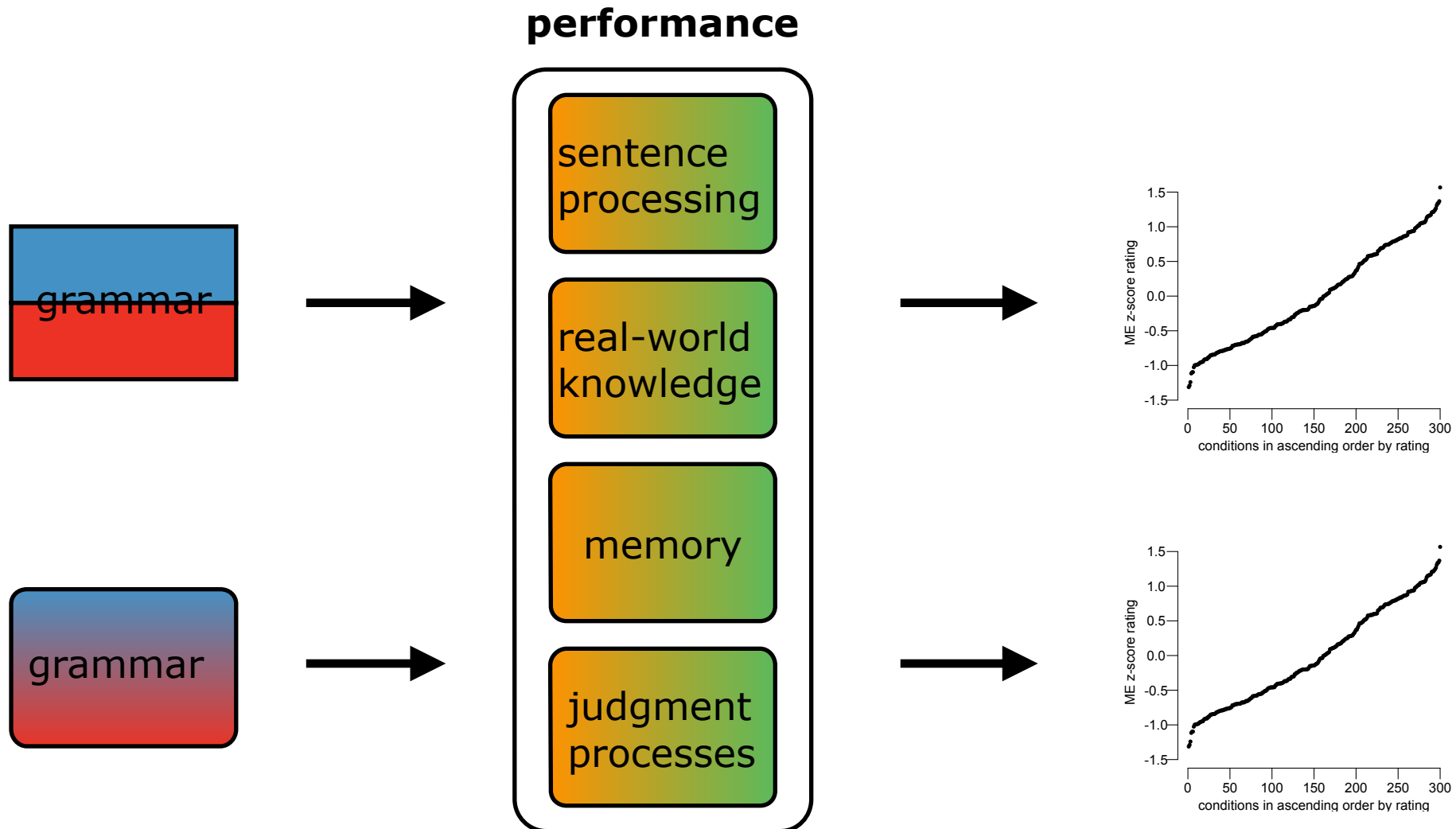
Gradient grammars allow for a continuous spectrum of grammaticality.



# Why it has never convinced syntacticians

## Counter-argument 1:

Judgments are part of language performance. Once you add performance components to the judgment process, there are tons of ways to explain gradience.



# Why it has never convinced syntacticians

**Counter-argument 2:** Grammars do so much more than just explain acceptability judgments.

1. Explain deep differences between seemingly identical sentence types through different structures.

Agent  
The child screamed.

Patient  
The towel dried <the towel>.

2. Explain deep similarities between seemingly distinct sentence types through shared operations, and constraints on those operations.

\* What do you wonder [whether Jack stole \_\_\_]?

\* I like the necklace that you wonder [whether Jack stole \_\_\_]?

3. Explain constraints on the variation in the structures, operations, and constraints across languages

English 

WH	NP	Adj
----	----	-----

Italian 

WH	NP	Adj
----	----	-----

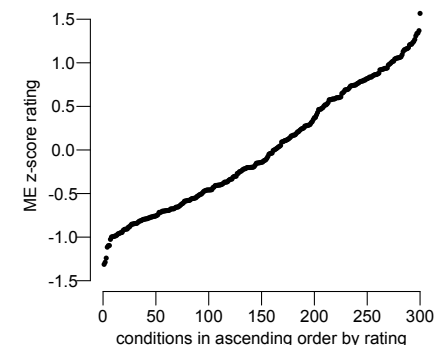
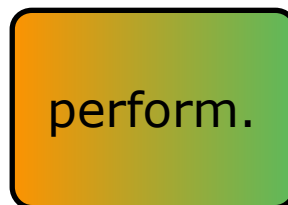
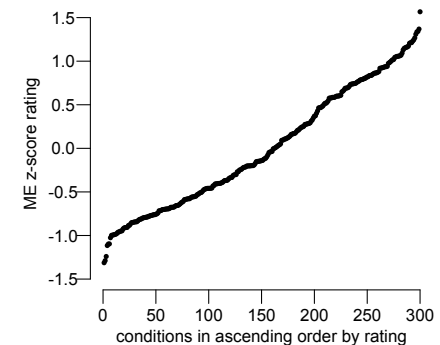
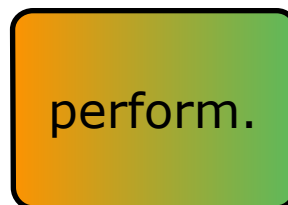
Swedish 

WH	NP	Adj
----	----	-----

# Taking the question of gradience seriously

The fact that there are some constraints that do not cause low acceptability is part and parcel with another fact that I've been obscuring up until now: there is **variation in the size of the different island effects**.

The question we face is how account for this variation. Both grammatical architectures can handle it, but the way they handle it is different:



And each approach has different consequences for deeper questions, like what our theory of cross-linguistic variation must look like.

# Quantifying island constraint effect sizes

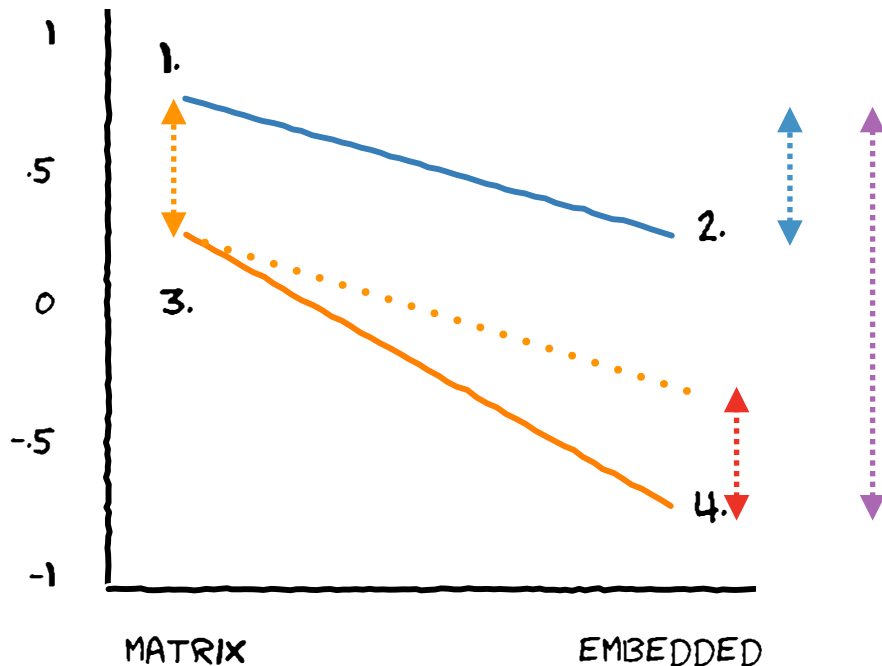
# Quick reminder: the 2x2 factorial design

complex phrase effect

global effect

1. Who \_\_\_ thinks that Jack stole the necklace?
2. What do you think that Jack stole \_\_\_?
3. Who \_\_\_ wonders whether Jack stole the necklace?
4. \*What do you wonder whether Jack stole \_\_\_?

dependency effect



dependency effect (1-2)

complexity effect (1-3)

+ constraint + X

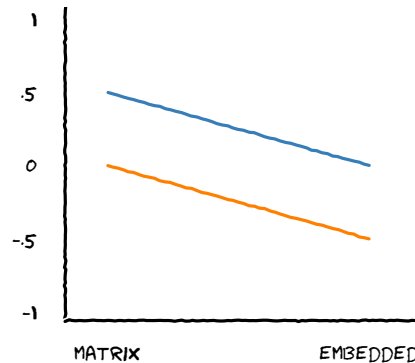
global effect (1-4)

If there is a **grammatical constraint**, the two independent effects won't be enough to explain the total global effect. We'll need to add the constraint's effect in.

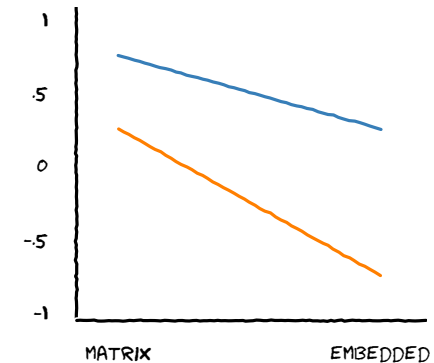
# The (2x2) factorial definition does both identification and quantification!

First, we can easily spot the presence of a constraint by looking for the “something extra” pattern (called super-additivity).

No constraint



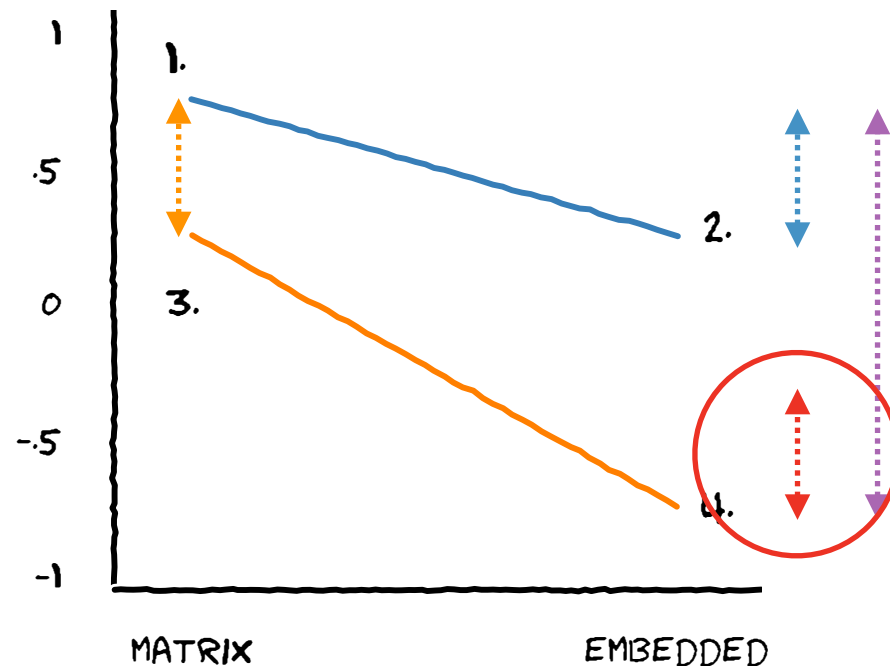
Constraint



Second, we can quantify the **size of the effect of the constraint** with simple subtraction.

$$(1-4) = (1-2) + (1-3) + X$$

—/algebra/—



$$X = (2-4) - (1-3)$$

# Adding effect sizes to the chart!

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move	Red	Red	Grey	Red	Red	Red	Grey	Red
	rc-move	Red	Red	Grey	Red	Red	Red	Grey	Green
	in-situ	Green	Green	Grey	Green	Green	Green	Grey	Green
	d-linking	Green	Orange	Grey	Red	Red	Red	Grey	Red
Italian	wh-move	Green	Red	Grey	Red	Red	Red	Grey	Red
	rc-move	Green	Red	Grey	Red	Red	Red	Grey	Red
Swedish	wh-move	Orange	Orange	Grey	Orange	Red	Red	Grey	Red
Norwegian	wh-move	Orange	Orange	Grey	Orange	Red	Red	Grey	Red
Arabic	wh-move	Red	Green	Grey	Red	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Grey	Green	Green	Green	Grey	Green
Exceptions	non-finite	Green	Grey	Grey	Green	Green	Grey	Grey	Green
	np recurs	Grey	Green	Grey	Grey	Grey	Red	Grey	Grey
	events	Grey	Grey	Grey	Green	Grey	Grey	Grey	Red



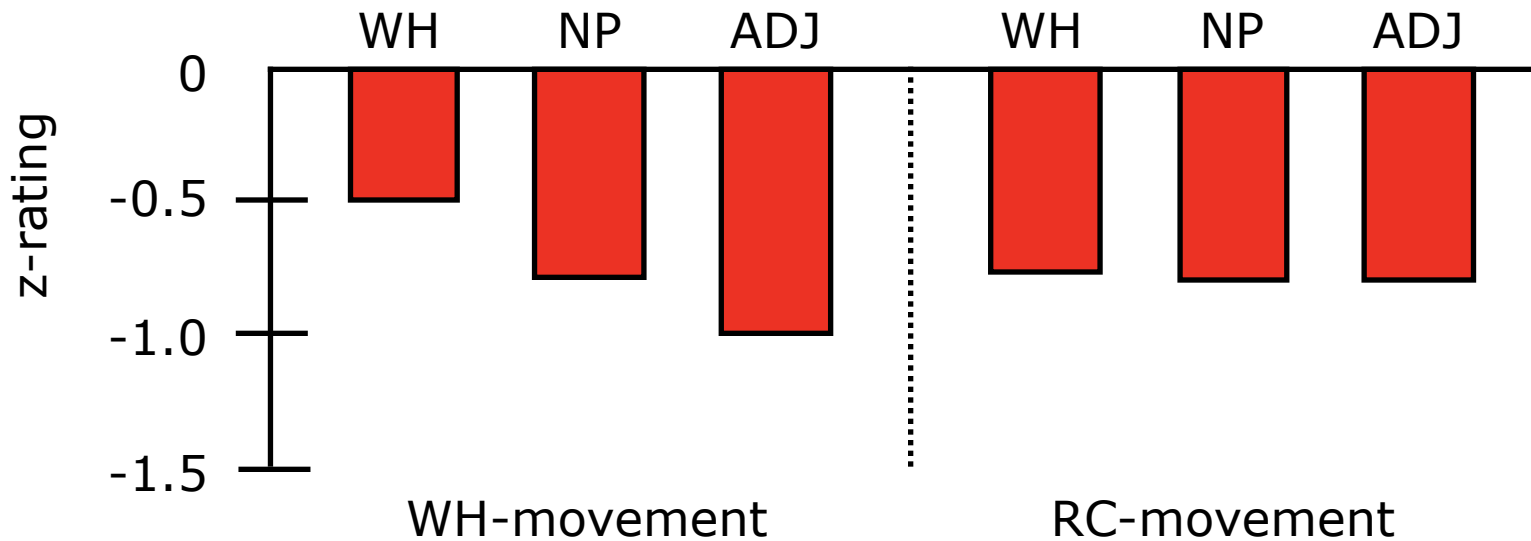
# Adding effect sizes to the chart!

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move					1.15	1.05		0.70
	rc-move					0.40	0.50		
	in-situ								
	d-linking					0.60	0.50		0.75
Italian	wh-move					1.70	0.90		1.30
	rc-move					0.70	0.60		1.05
Swedish	wh-move					0.75	1.60		1.15
Norwegian	wh-move					0.75	1.30		1.30
Arabic	wh-move								
Japanese	in-situ								
Exceptions	non-finite								
	np recurs						1.00		
	events								0.75

# The relative sizes of island effects

# Variation in the size island effects

**Traditional approach:** rating of the "island violation" sentence:



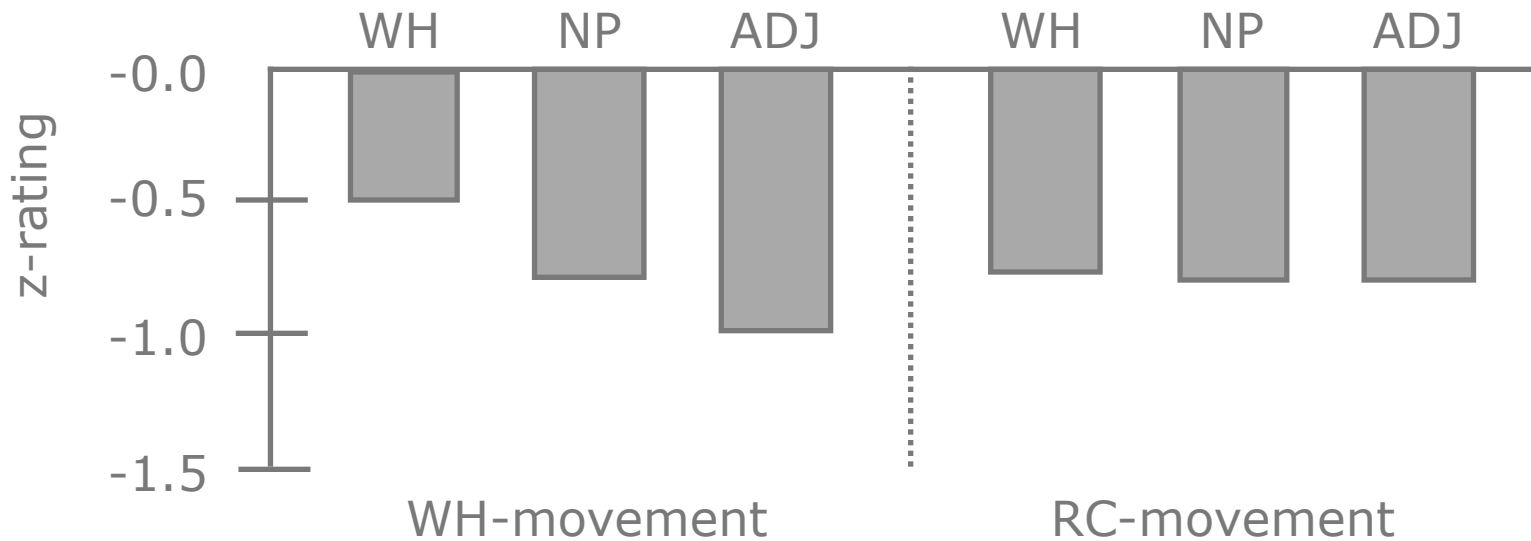
The traditional approach suggests that  $ADJ > NP > WH$  in WH-movement.

And that  $ADJ = NP = WH$  in RC-movement.

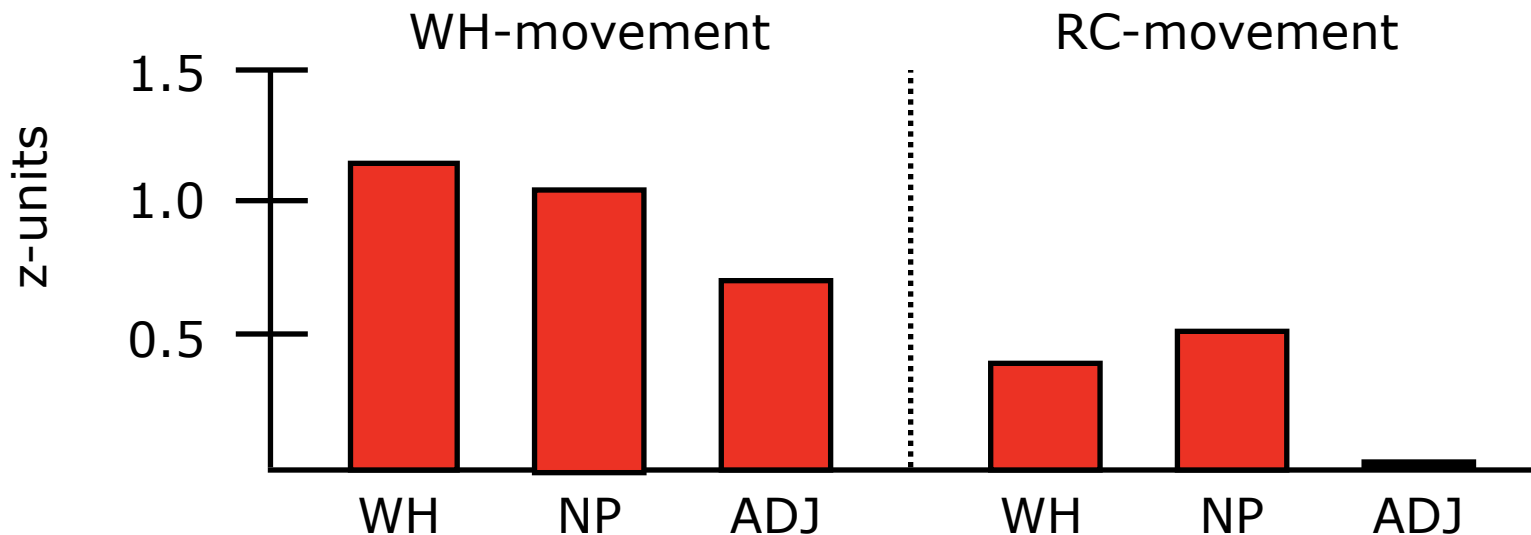
It also suggests that there is no major difference between WH-movement and RC-movement in terms of the size of the island effect (all are rated about the same)

# Variation in the size island effects

**Traditional approach:** rating of the "island violation" sentence:



**2x2 approach:** the precise size of the constraint



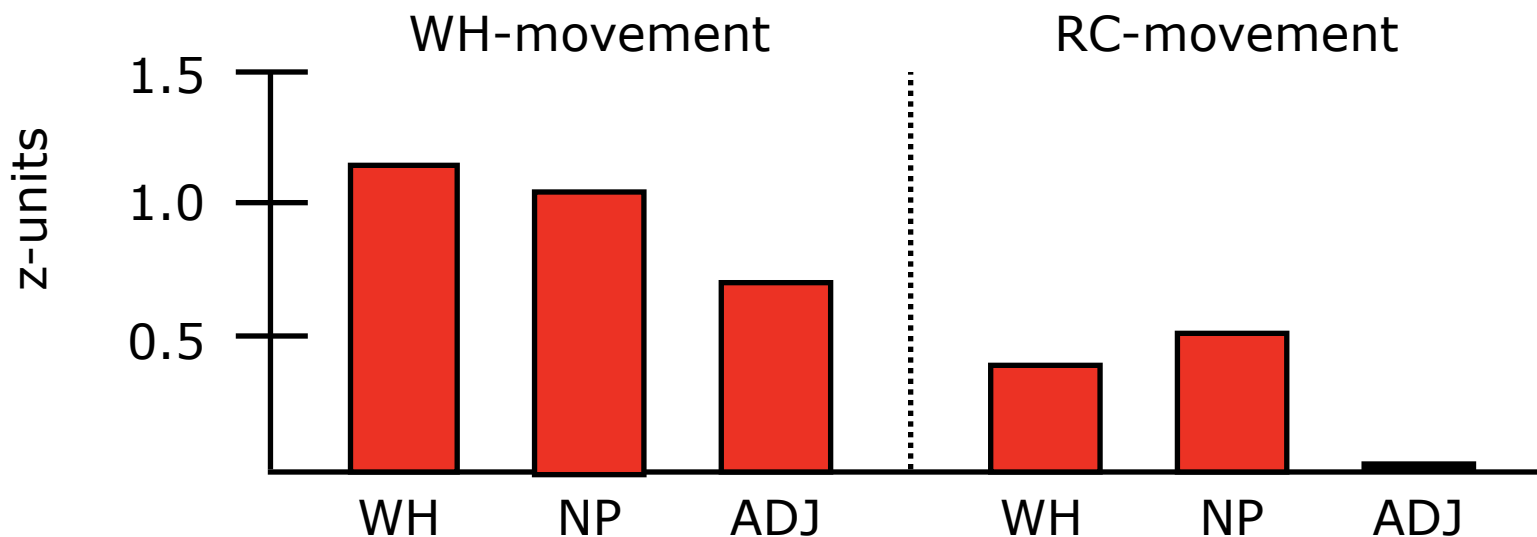
# Variation in the size island effects

The factorial definition suggests that  $WH > NP > ADJ$  in WH-movement.

And that  $NP > WH$  in RC-movement. (There is no ADJ in RC-movement)

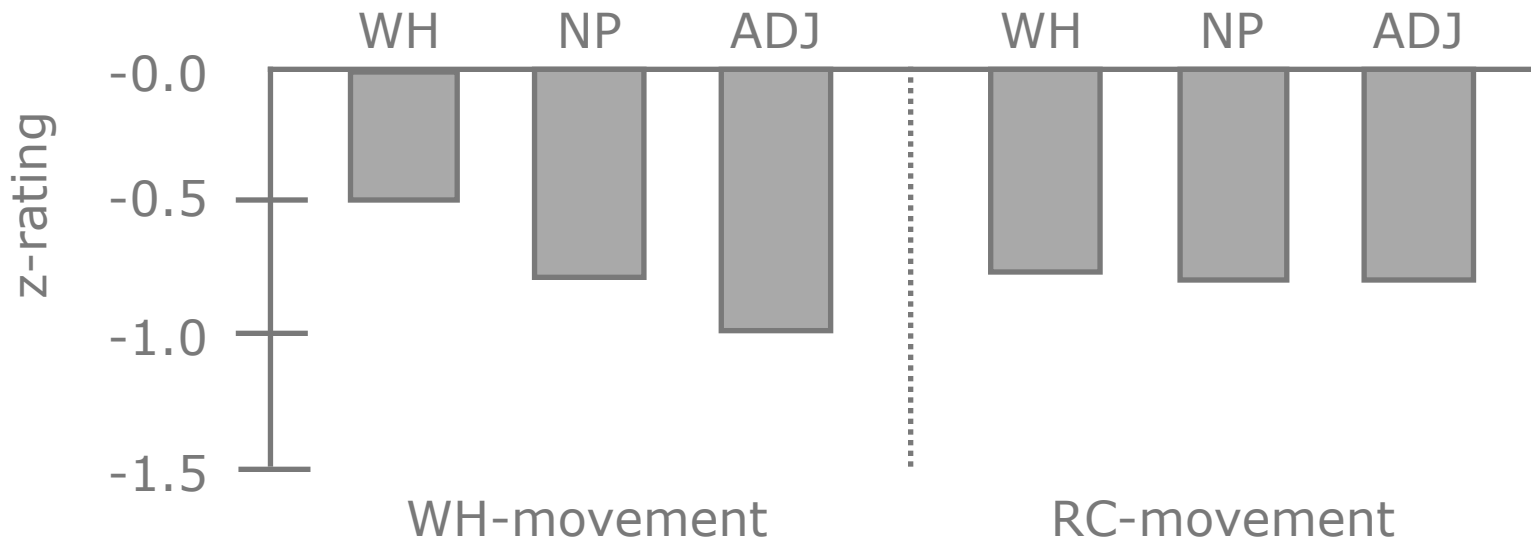
It also suggests that WH-movement island effects are larger than RC-movement island effects.

**Factorial approach:** the precise size of the constraint

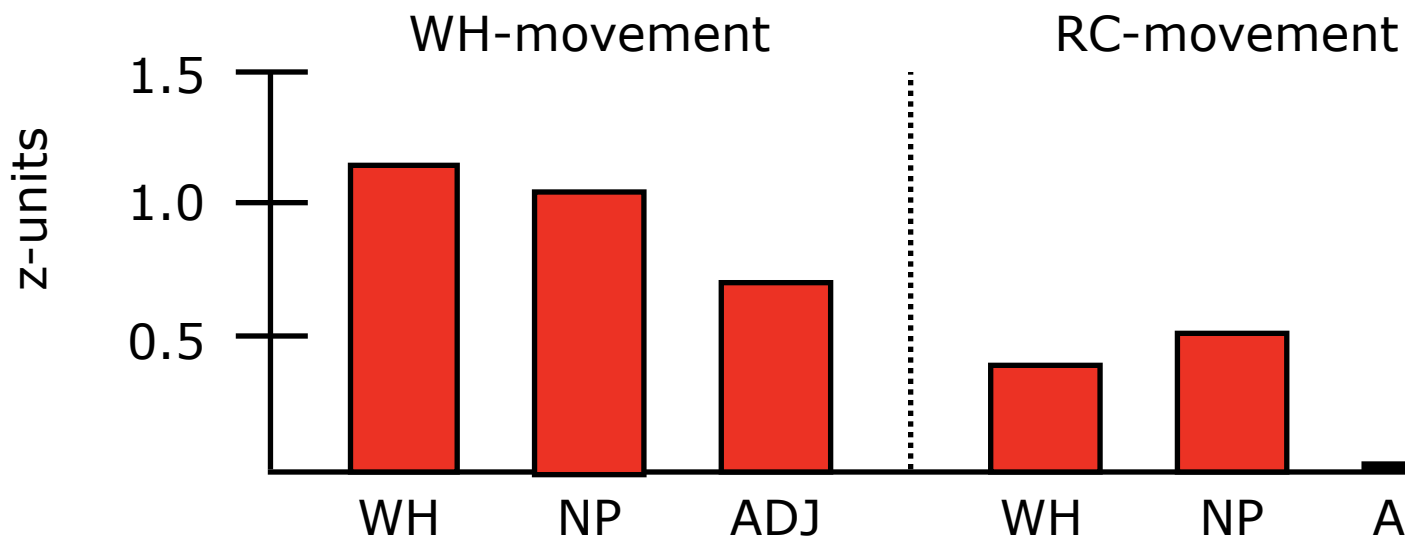


# Variation in the size island effects

**Traditional approach:** rating of the "island violation" sentence:



**Factorial approach:** the precise size of the constraint



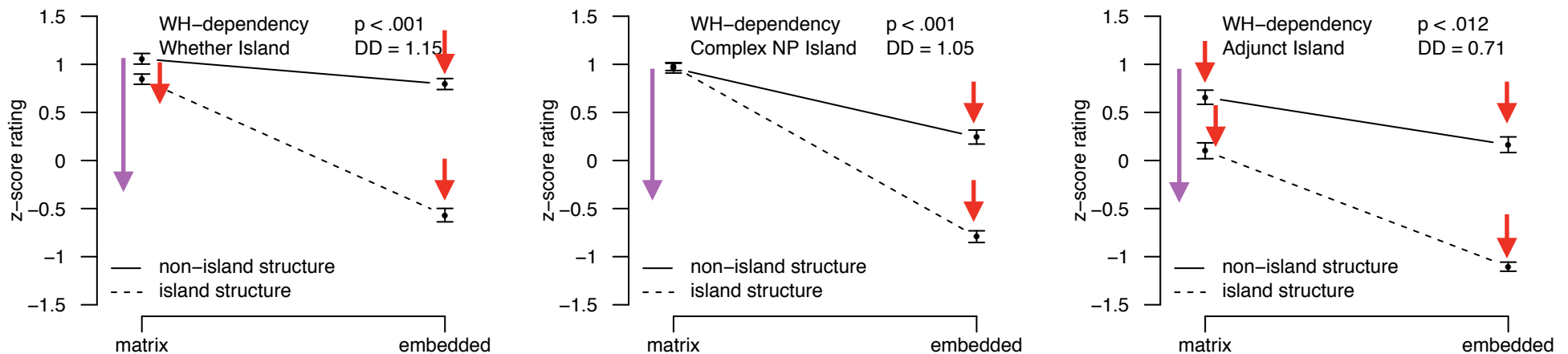
The 2x2 definition reverses the pattern inside WH-movement and shows RC-movement to be smaller!

# Explaining the gradient

## Binary Grammar:

A binary grammar only has two values (grammatical/ungrammatical), so any differences have to be explained as **extra-grammatical adjustments** to the **individual sentences**.

One way to cash this out is to assume that all **ungrammatical sentences are penalized the same amount**, symbolized with the **purple arrow**:



Then, we need to identify extra-grammatical effects that adjust each of the sentences to arrive at the pattern (**red arrows**).

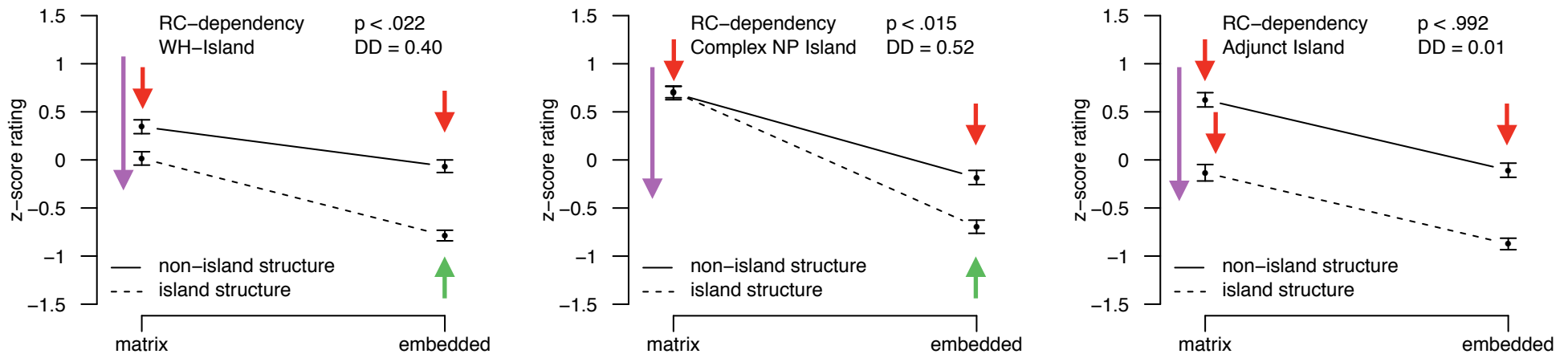
To be completely honest, I don't know if this will work, because we don't yet have a complete theory of all of the factors that affect acceptability.

# Explaining the gradient

## Binary Grammar:

A binary grammar only has two values (grammatical/ungrammatical), so any differences have to be explained as **extra-grammatical adjustments** to the **individual sentences**.

One way to cash this out is to assume that all **ungrammatical sentences are penalized the same amount**, symbolized with the **purple arrow**:



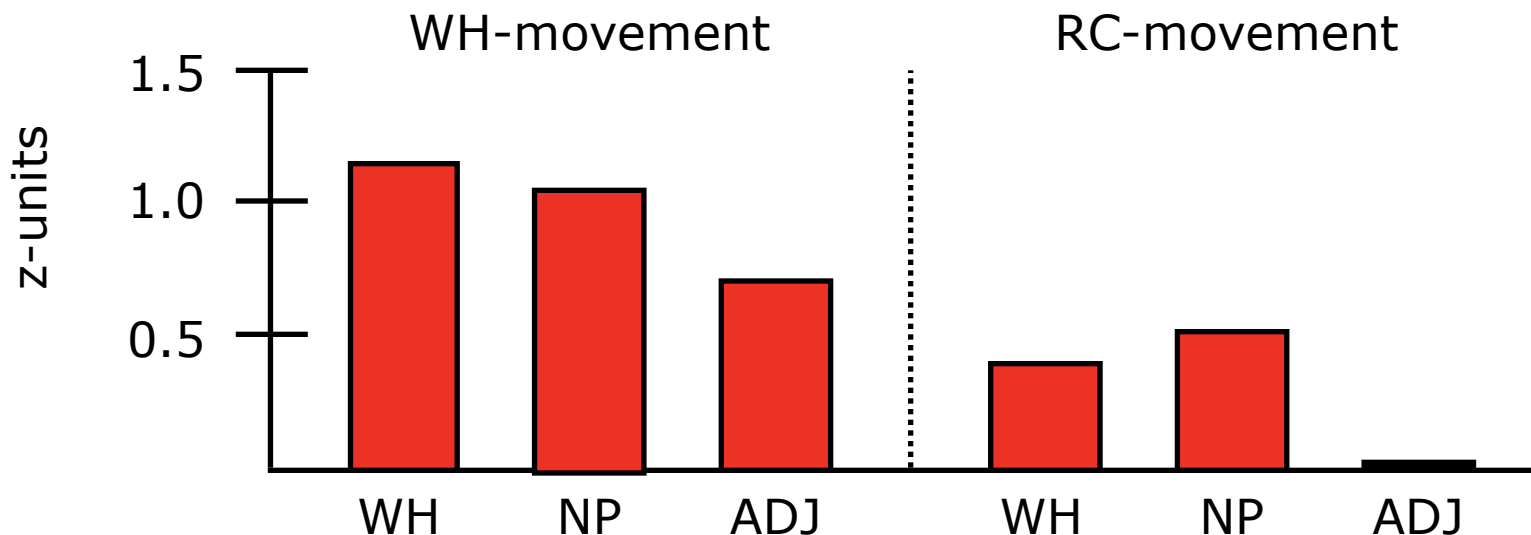
For RC-movement, it looks like we need factors that decrease the acceptability of the grammatical sentences, and **factors that increase the acceptability** of the island violations (perhaps violations are smaller if they occur in deeply embedded clauses?)



# Explaining the gradient

## Gradient Grammar:

Gradient grammars can assign distinct values to each structure and/or constraint violation. This means they focus on the **constraint effect sizes**, not the individual sentences.



One way to cash this out is to postulate **a distinct value** for each constraint.

## This raises very difficult questions:

How many distinct island violations are there? (How much work is done by the constraints, and how much by the extra-grammatical factors?)

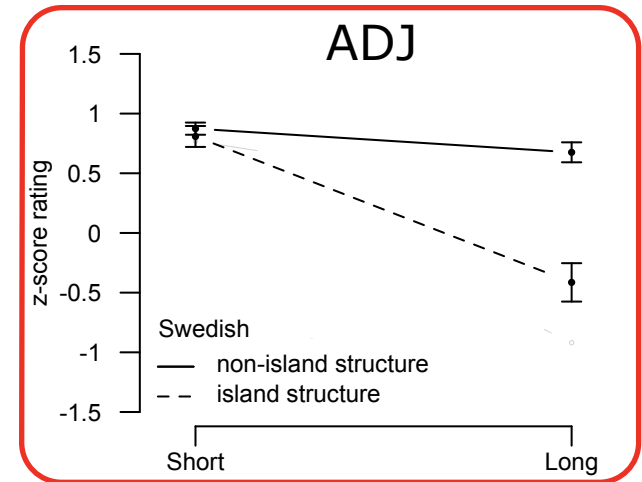
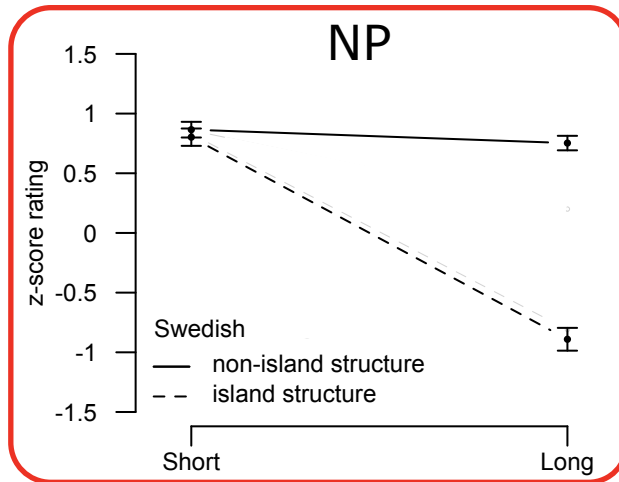
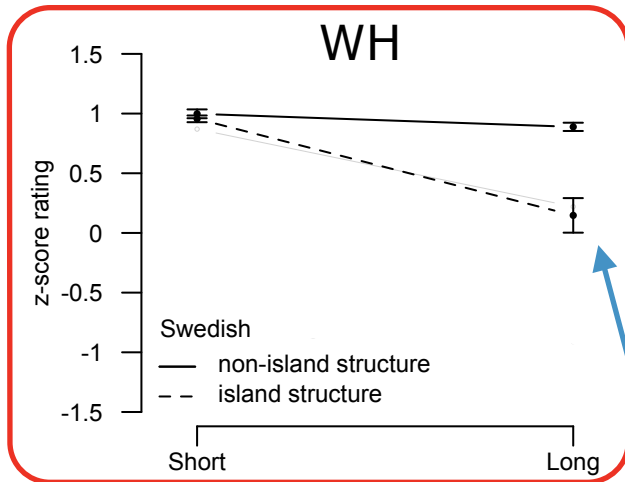
Is it just a standalone “penalty” that is in the system for some reason?

Constraint violations without low  
acceptability

# Swedish and Norwegian WH-movement

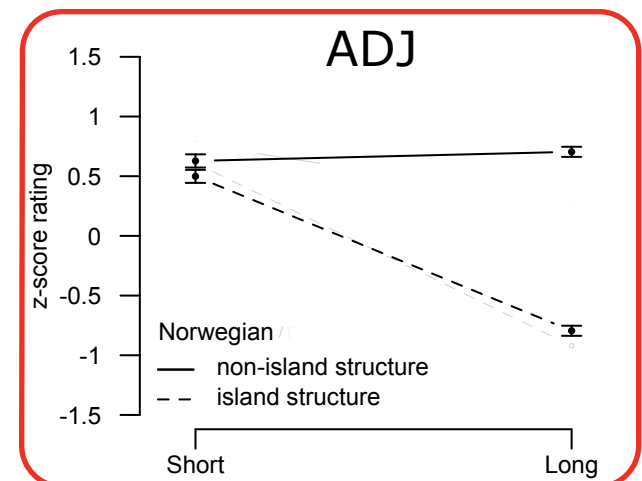
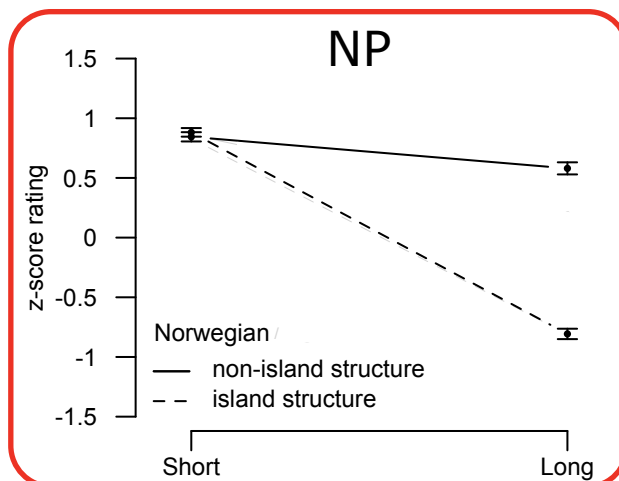
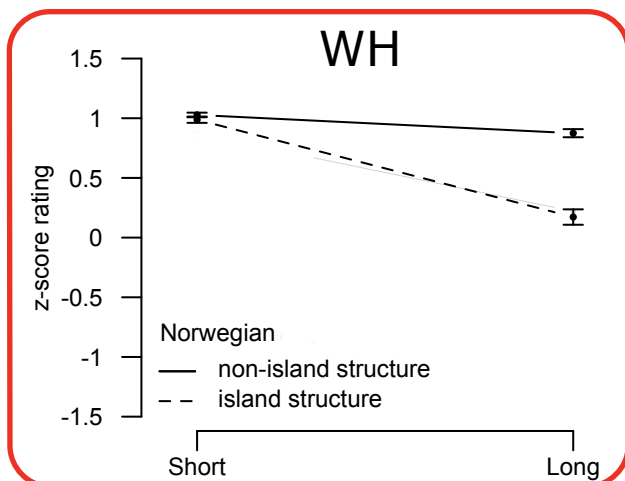
We've already seen that Swedish and Norwegian show superadditive interactions, suggesting that there are constraints at work.

## Swedish:



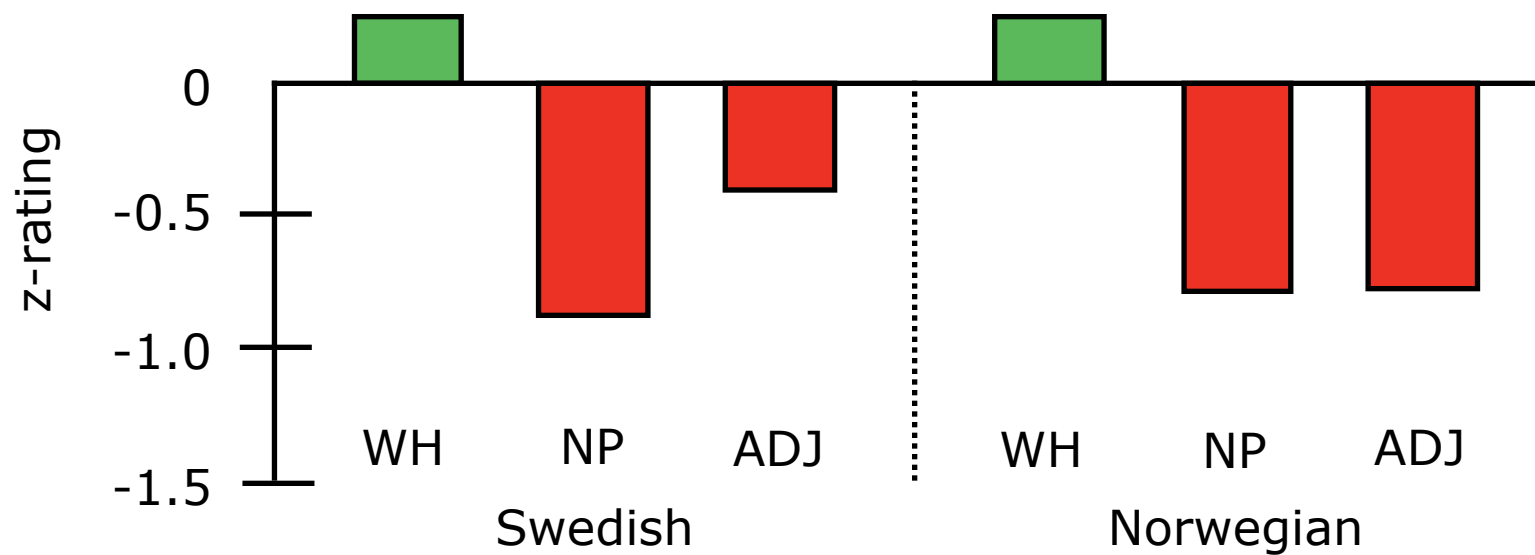
But the interesting fact is how acceptable the wh-island violation is!

## Norwegian:

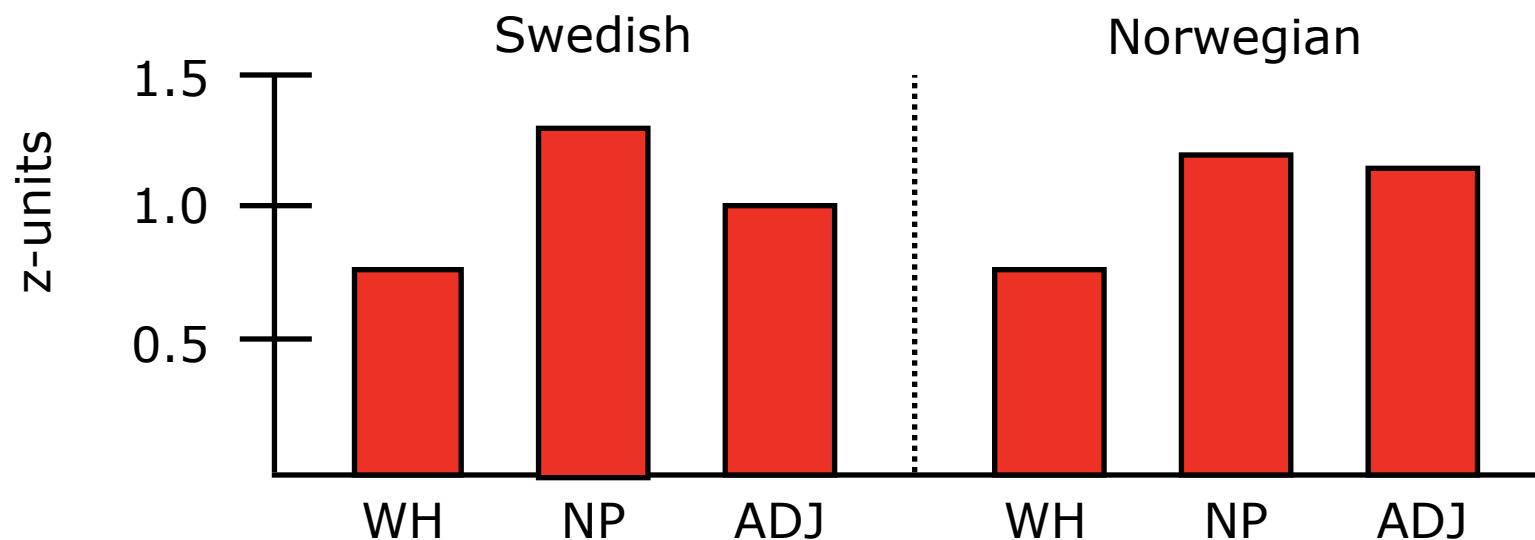


# Swedish and Norwegian WH-movement

## Rating of the island-violating sentence:

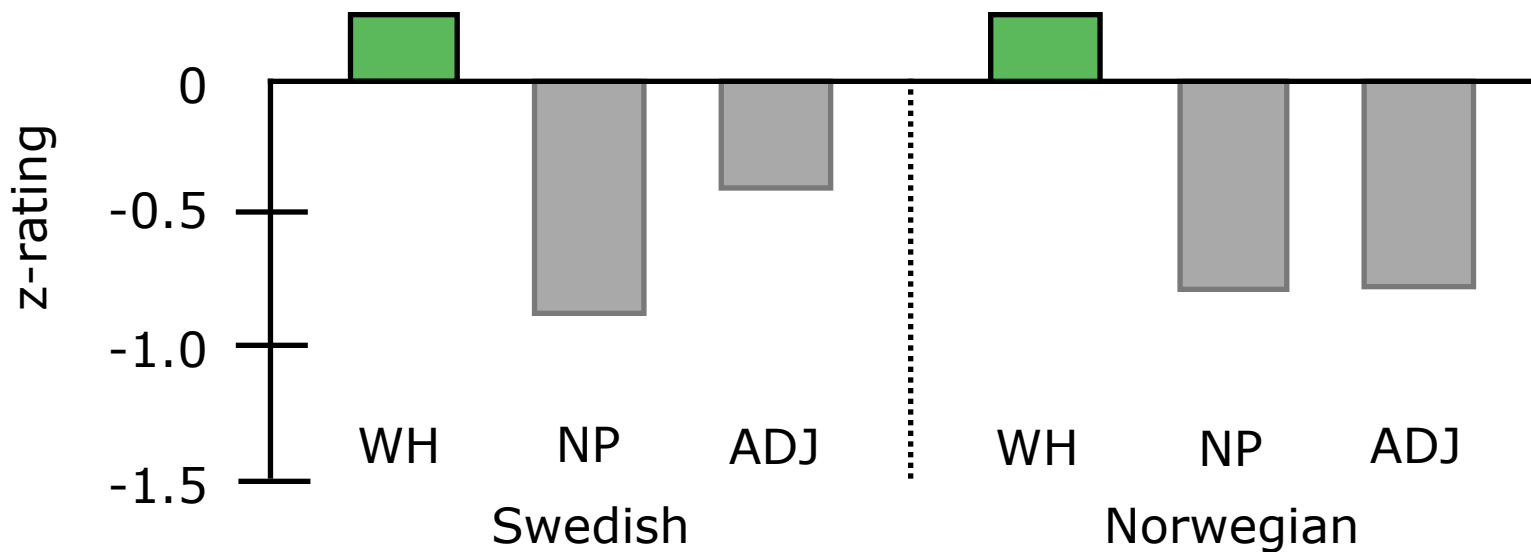


## Size of the effect of the constraint:



# Swedish and Norwegian WH-movement

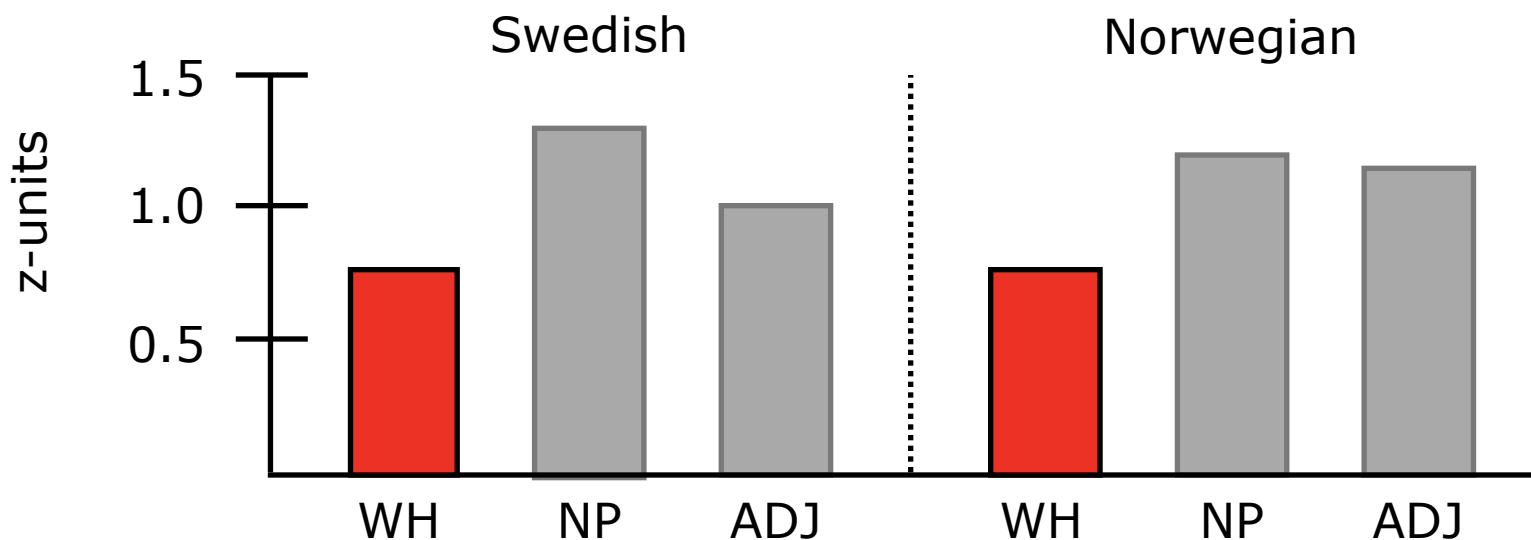
## Rating of the island-violating sentence:



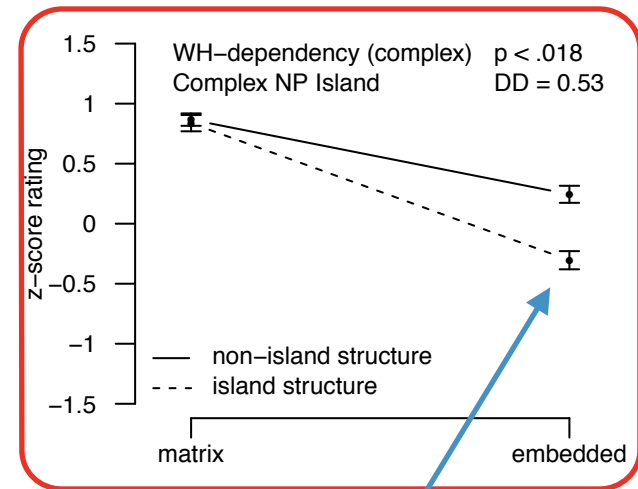
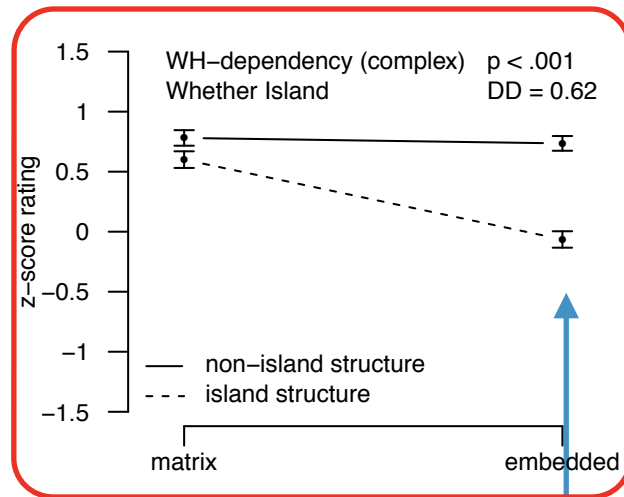
What do we make of this?

The ratings are in the **acceptable range**, but there is a **constraint** at work!

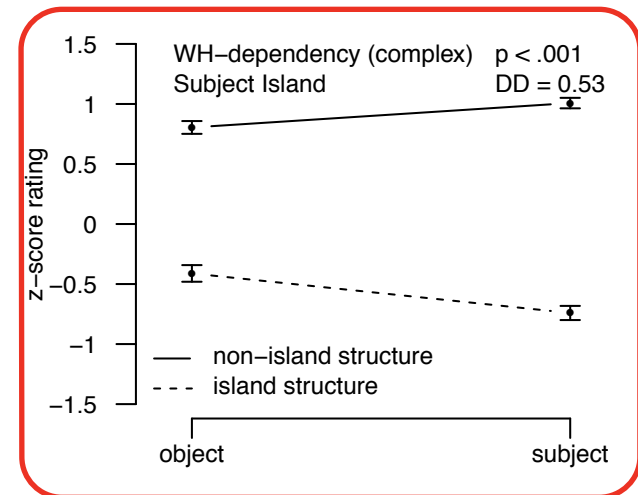
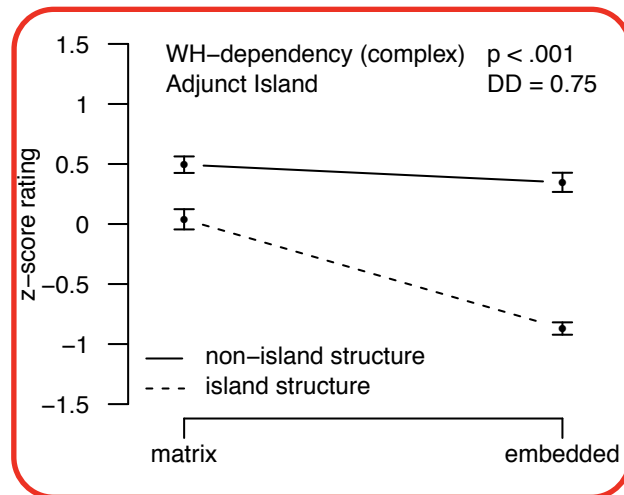
## Size of the effect of the constraint:



# We see something similar with D-linking

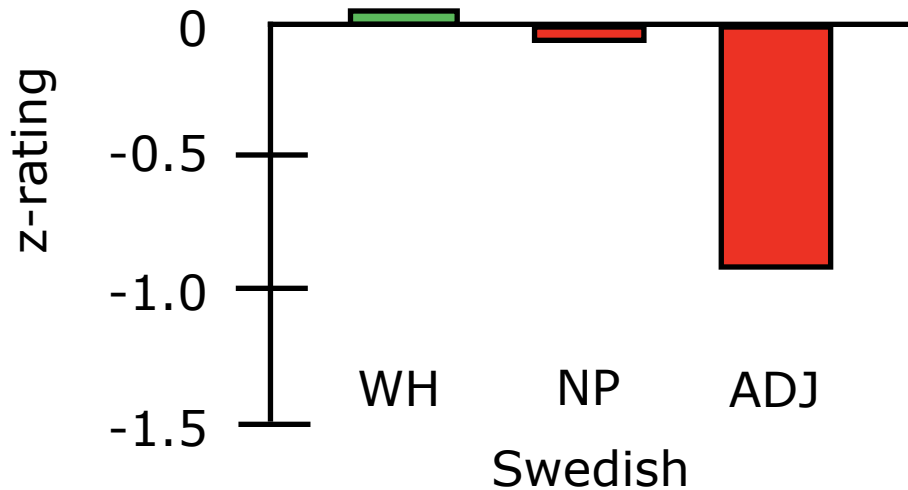


The island-violating sentence for both wh-islands and np-islands are fairly acceptable.



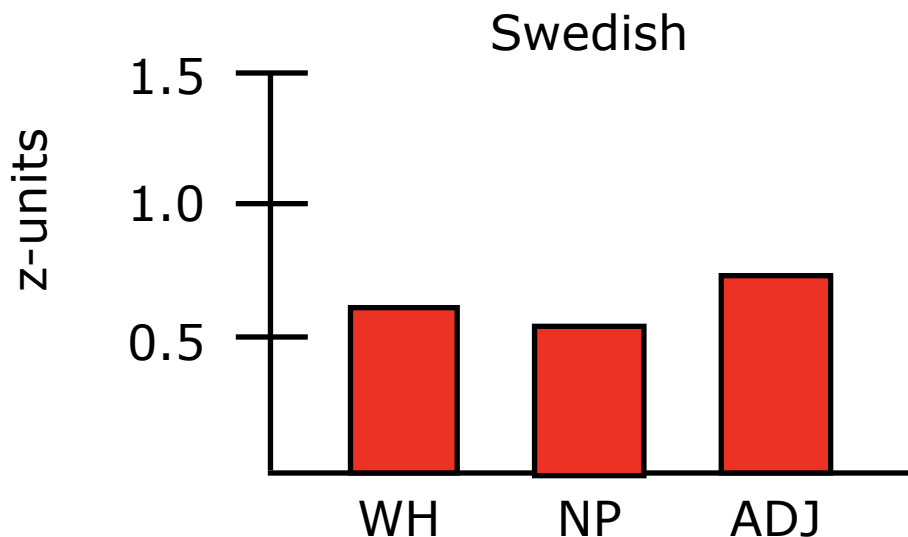
# We see something similar with D-linking

## Rating of the island-violating sentence:



On the one hand, this goes a long way toward explaining why it is that the literature has debated the status of these islands (Swedish/Norwegian, and English D-linking).

## Size of the effect of the constraint:

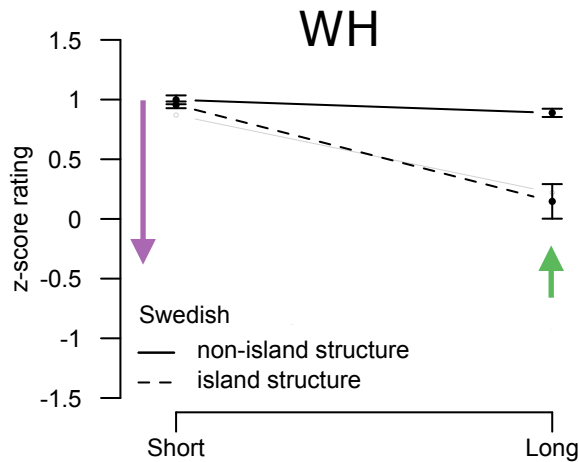


On the other hand, they raise really difficult questions about how there could be a constraint violation at work without resulting in low acceptability.

# A binary grammar explanation

Recall that binary grammars have to say that any constraint violation leads to one standard-sized penalty. Any deviations from this come from extra-grammatical factors.

## Swedish:

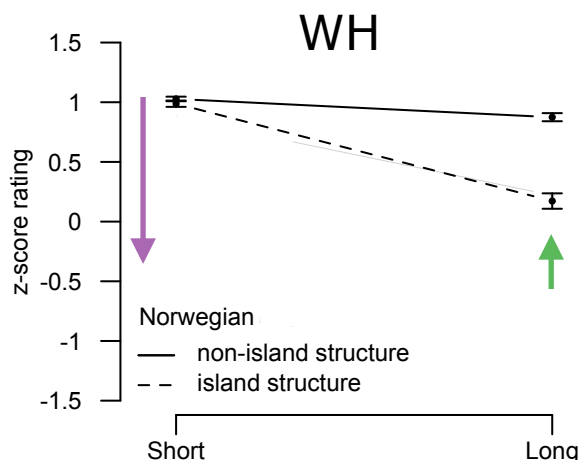


The puzzle here is that the island-violating-sentence is **so much more acceptable** than expected.

This can only be explained by an extra-grammatical factor that **substantially raises** acceptability.

To be completely honest, I do not know what this could be. It is easy to come up with factors that can lessen the impact of the constraint violation. But it is difficult to come up with factors that can lessen it so much that the sentence is as acceptable as grammatical sentences.

## Norwegian:

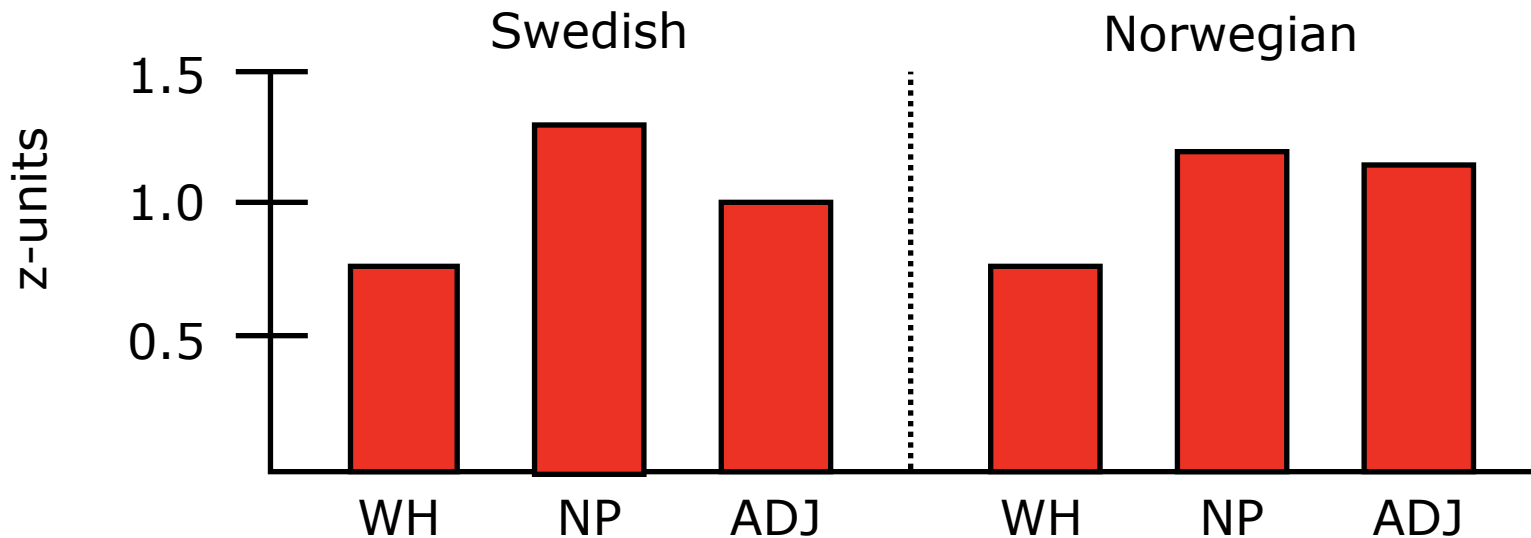


I suppose another option is to say that there is no constraint violation, but then we can't explain the superadditivity that we see in the pattern.

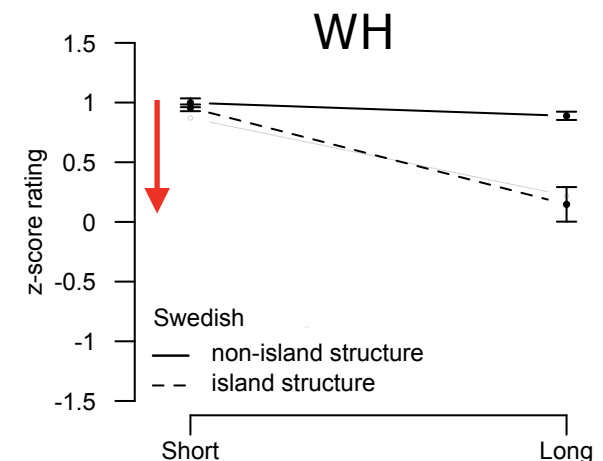


# A gradient grammar explanation

Recall that gradient grammars can assign different penalty values to each constraint.

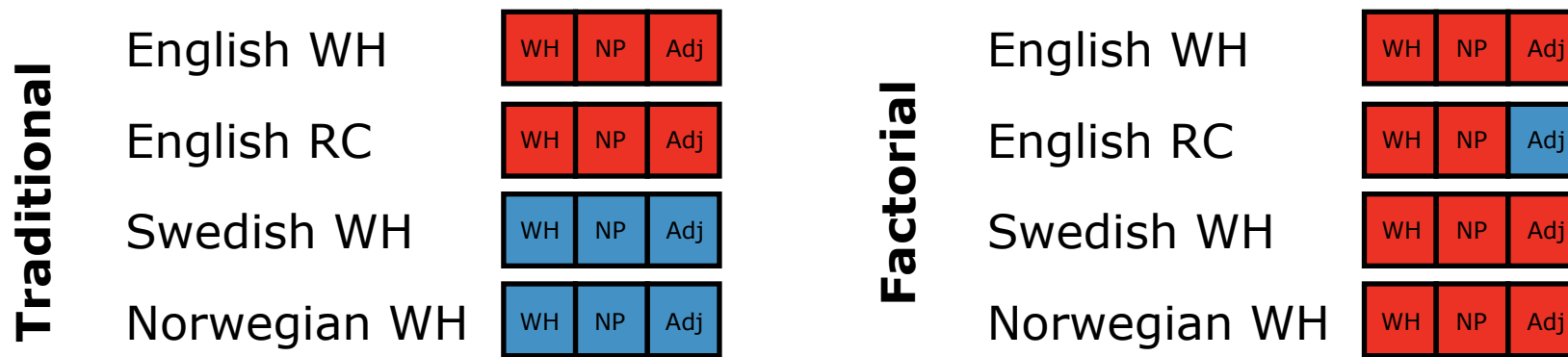


In this case, WH-islands are simply assigned a penalty of **0.75**, which is calculated from **the very high rating** given to the grammatical control sentences.



# Grammatical architecture and cross-linguistic variation

Binary grammars reduce the number of dimensions of possible variation among languages: it is simply the presence/absence of a constraint (or structure).



But gradient grammars increase it dramatically. There is both the presence/absence of the constraint AND the **value of the constraint**, where the value of the constraint can apparently take **any possible value!**



Can you have a conclusion section without  
any conclusions?

# Conclusion 1: The 2x2 definition is a logically superior way to test island effects

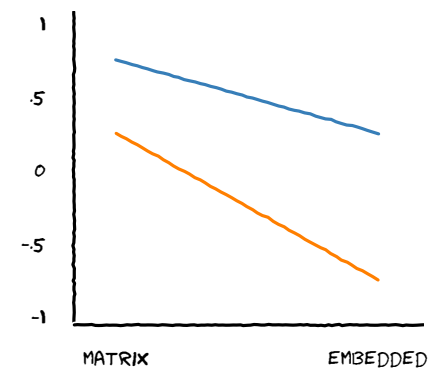
This has nothing to do with the results. I just think that this design better reflects the logic that syntacticians have always used to define island effects.

In short, in order for there to be a constraint at work, there must be **some work for the constraint to do**.

We know that there are extra-grammatical factors that affect acceptability judgments, so we need to factor them out of the effect before concluding that there is a constraint at work.

1. **Who** \_\_\_ thinks that Jack stole the necklace?
2. **What** do you think that Jack stole \_\_\_?
3. **Who** \_\_\_ wonders **whether Jack stole the necklace**?
4. \***What** do you wonder **whether Jack stole** \_\_\_?

## super-additive



The presence of superadditivity is not sufficient to prove that there is a constraint at work, but it is a **necessary condition**. All proposals for syntactic constraints should show superadditivity when tested using reductionist factors.

It should be impossible to reduce the effect to anything else!

# Conclusion 2: The results of the 2x2 challenge existing theories of island effects

		Informal Experiments				2x2 Definition			
Language	Type	WH	NP	SUB	ADJ	WH	NP	SUB	ADJ
English	wh-move	Red	Red	Red	Red	Red	Red	Red	Red
	rc-move	Red	Red	Red	Red	Red	Red	Red	Green
	in-situ	Green	Green	Green	Green	Green	Green	Green	Green
	d-linking	Green	Orange	Red	Red	Red	Red	Red	Red
Italian	wh-move	Green	Red	Green	Red	Red	Red	Red	Red
	rc-move	Green	Red	Green	Red	Red	Red	Green	Red
Swedish	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Norwegian	wh-move	Orange	Orange	Orange	Orange	Red	Red	Red	Red
Arabic	wh-move	Red	Green	Grey	Red	Green	Green	Grey	Orange
Japanese	in-situ	Green	Green	Green	Green	Green	Green	Green	Green
Exceptions	non-finite	Green	Grey	Grey	Green	Green	Grey	Grey	Green
	np recurs	Grey	Green	Grey	Grey	Grey	Red	Grey	Grey
	events	Grey	Grey	Grey	Green	Grey	Grey	Grey	Red

WH-movement and RC-movement are not identical.

Scandinavian and English D-linking both show island effects.

Non-finiteness is the only exception to structural island constraints.

# Conclusion 3: The 2x2 definition allows us to identify all 4 possible alignments

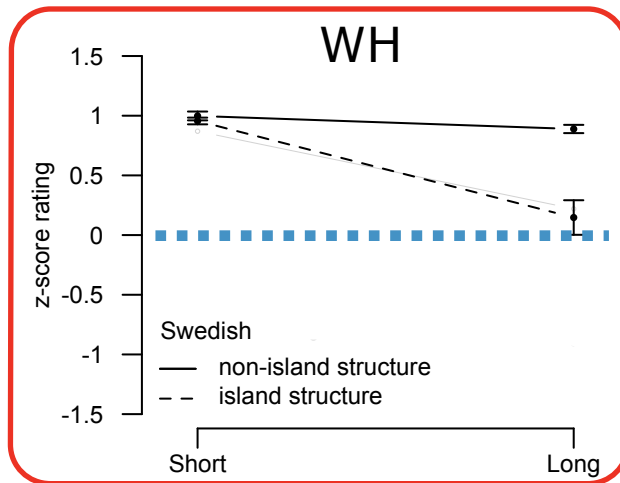
These four alignments have always been possible, but any design smaller than a 2x2 has been unable to detect them.

<b>Raw Acceptability</b>	<b>2x2 Superadditivity</b>	<b>Interpretation</b>
high	absent	No island constraint
low	present	Island constraint
high	present	Island constraint that does not lower acceptability too much
low	absent	No island constraint, but the illusion of one

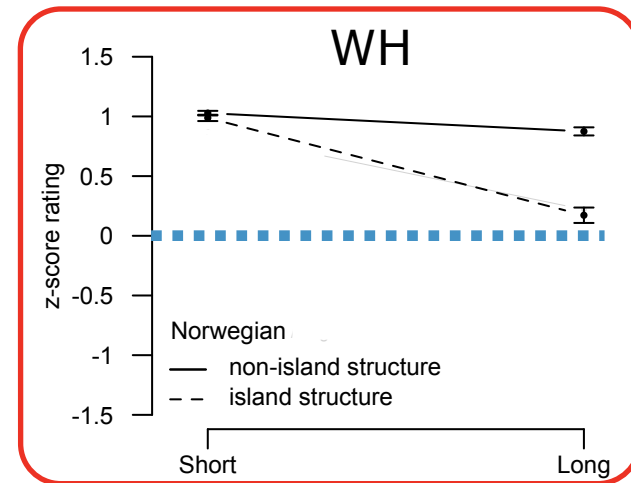
# Conclusion 4: Some of the debate in the literature has come from misalignments

Because raw acceptability was a large component of the informal definition of island effects, there was debate about middle-of-the-road sentences:

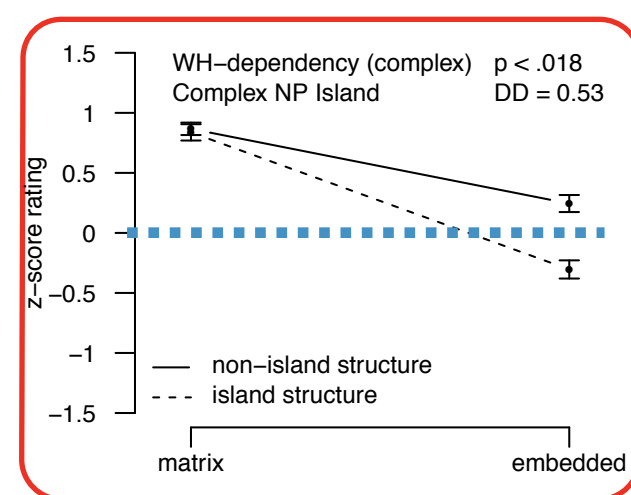
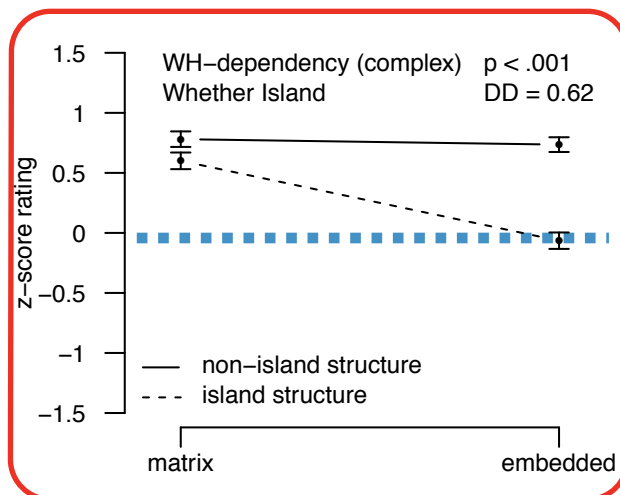
## Swedish:



## Norwegian:

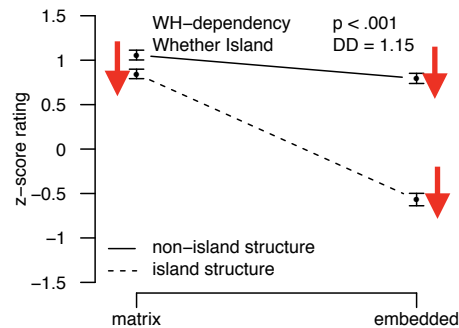


## English D-linking:

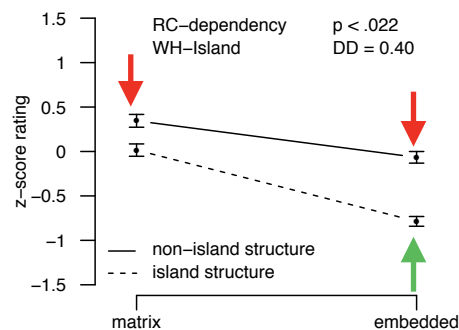


# Conclusion 5: Binary grammars have some challenges ahead to explain effect sizes

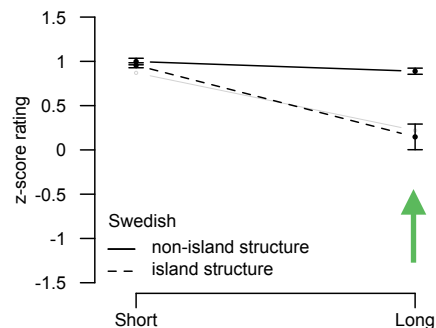
If you prefer **binary grammars**, then these are the puzzles that we need to solve:



First, we need to identify extra-grammatical effects that adjust each of the sentences to arrive at the gradient patterns we see (**red arrows**).



For RC-movement, it looks like we need factors that decrease the acceptability of the grammatical sentences, and **factors that increase the acceptability** of the island violations (perhaps violations are smaller if they occur in deeply embedded clauses?)

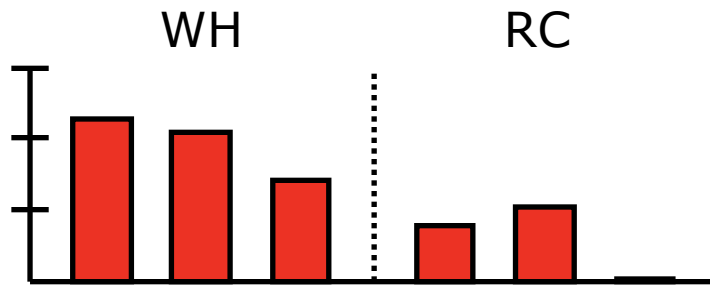


For Scandinavian, we need an extra-grammatical factor that **substantially raises** acceptability.

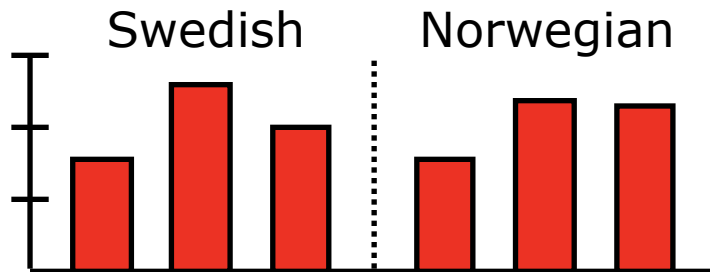


# Conclusion 6: Gradient grammars have some challenges ahead too!

If you prefer **gradient grammars**, then these are the puzzles that we need to solve:



There are two ways to explain gradience: the grammar and extra-grammatical factors. How do we distinguish the two? In other words, how many distinct island constraints are there, and how much is explained by extra-grammatical factors?

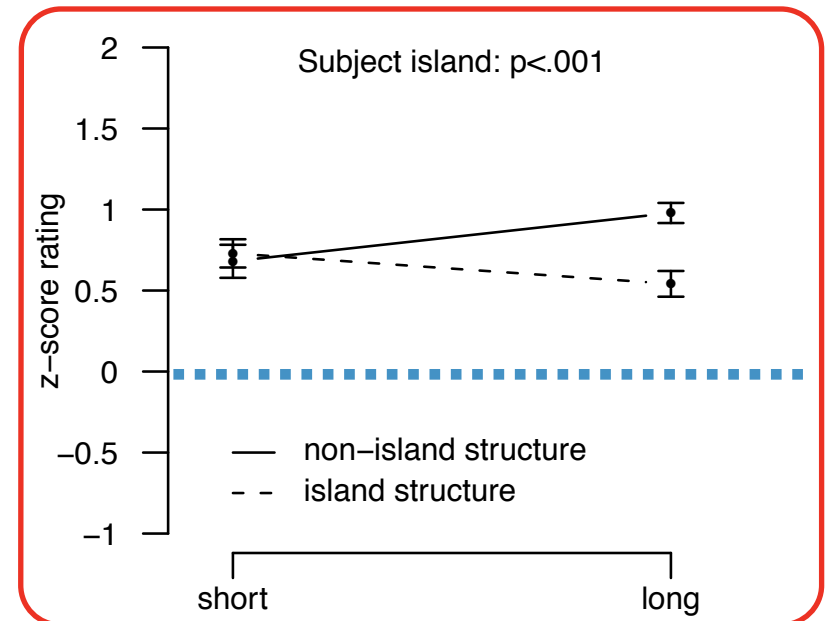
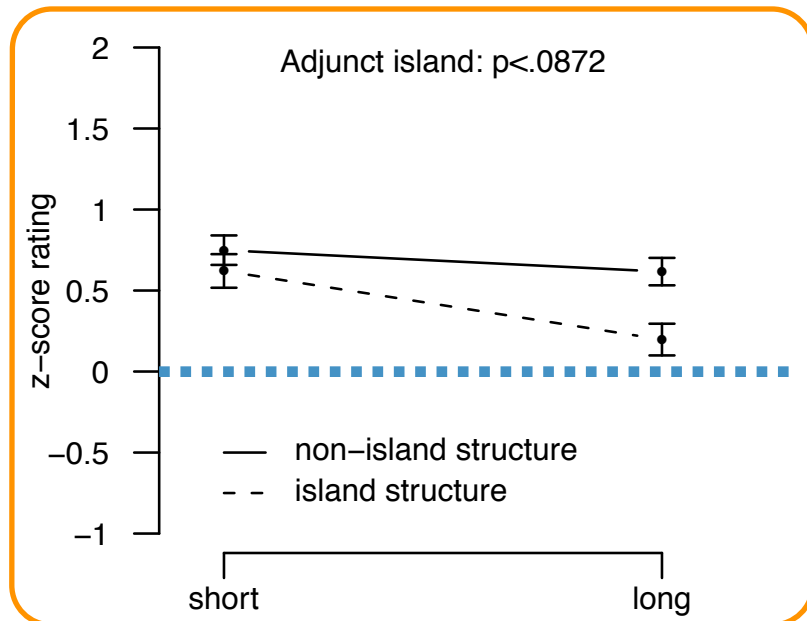
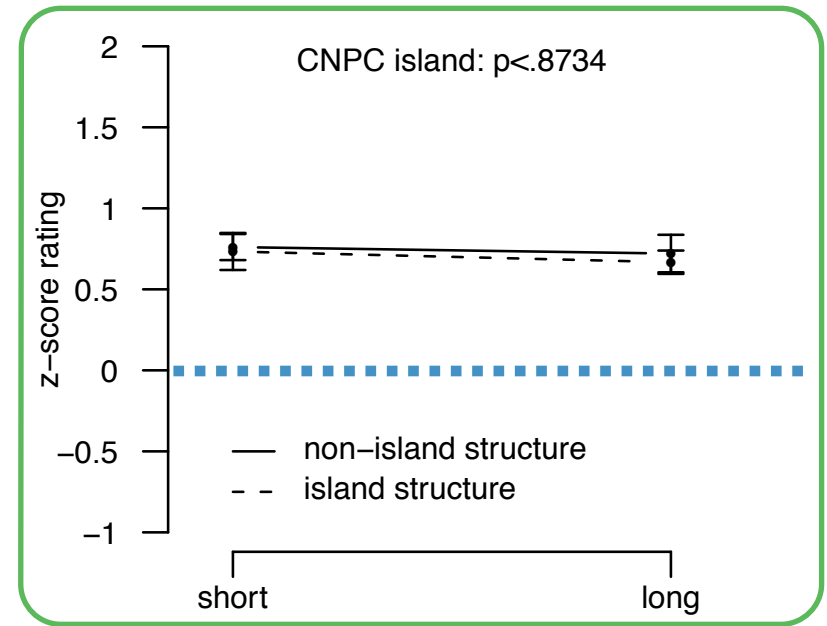
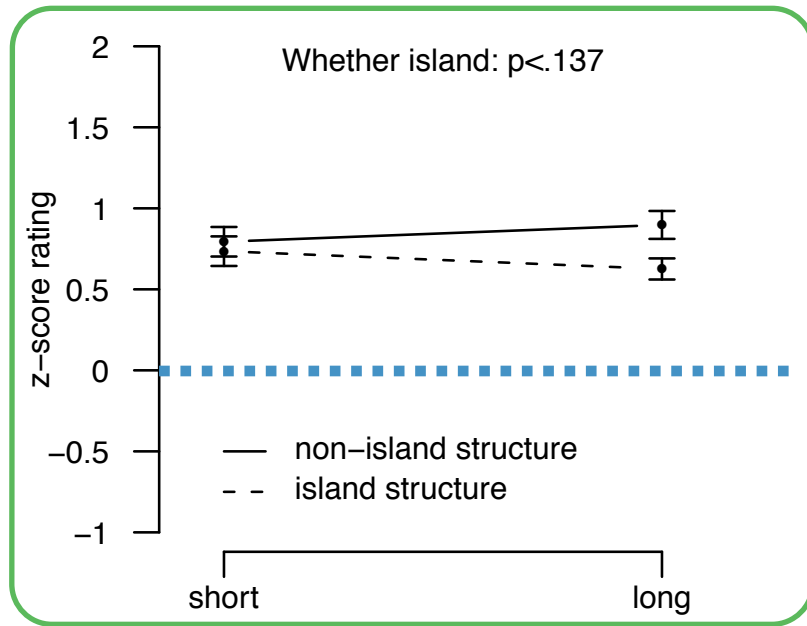


What is gradience? Is gradience grounded in something deeper, like probabilities, or is it just a penalty built into the system?



Gradient grammars increase the space of possible variation. Are there any constraints on that variation? Or are any combinations of values possible?

# Conclusion 7: I don't know what is going on with Sluicing



# THANK YOU!

## and thank you to my generous collaborators!

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Haskins Lab



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Norwegian University  
of Science and Technology



**Shin Fukuda**  
U. Hawaii



**Hajime Ono**  
Tsuda U.



**Robert Kluender**  
UC San Diego



**Ivano Caponigro**  
UC San Diego



**Ciro Greco**  
U. Ghent



**Carlo Cecchetto**  
U Milan-Bicocca

