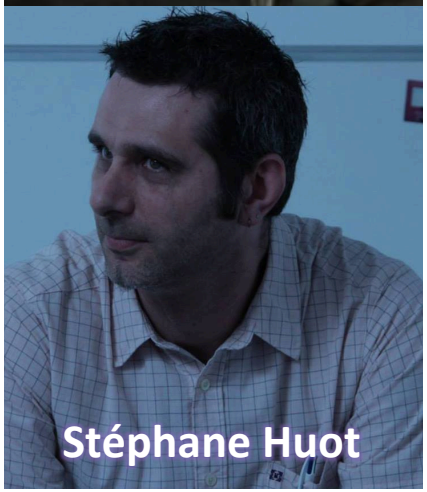
Running an HCI Experiment In Multiple Parallel Universes

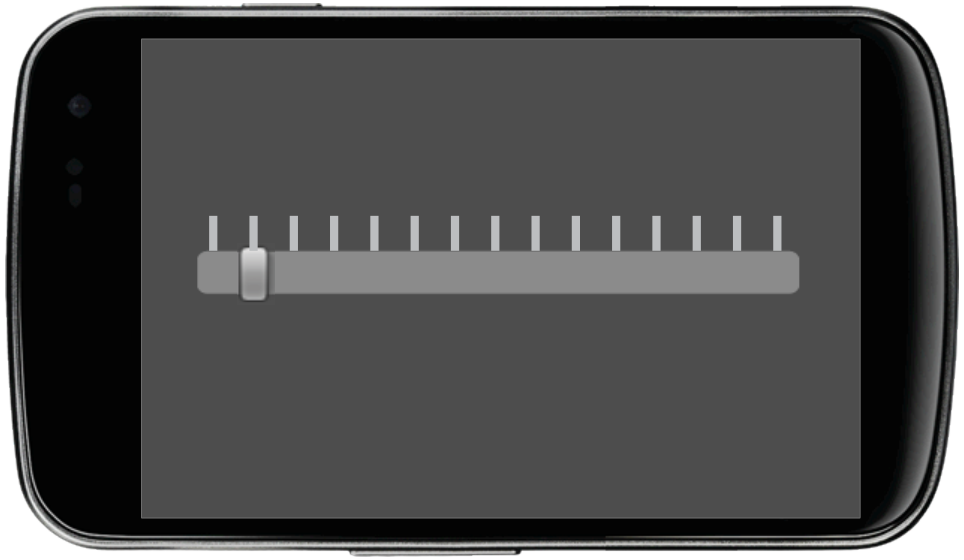
Table 1: ANOVA table.

Source	df	F	Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
Technique	1,11	2.1350	0.1719	0.0547	0.0040**	0.0317*	0.0212*	0.0977
Difficulty	1,11	5.1621	0.0442*	0.0495*	0.0007***	0.3299	0.0665	0.0031**
Technique×Difficulty	1,11	22.6791	0.0006***	0.2030	0.0734	0.0106*	0.0375*	0.0026**

Universe 1 2 3 4 5 6



A Study of the Effect of Haptic Feedback on Touch Sliders



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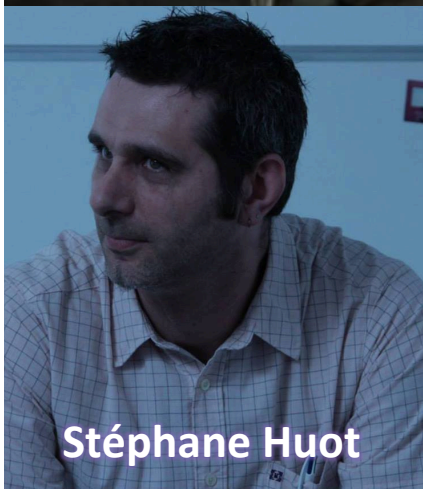

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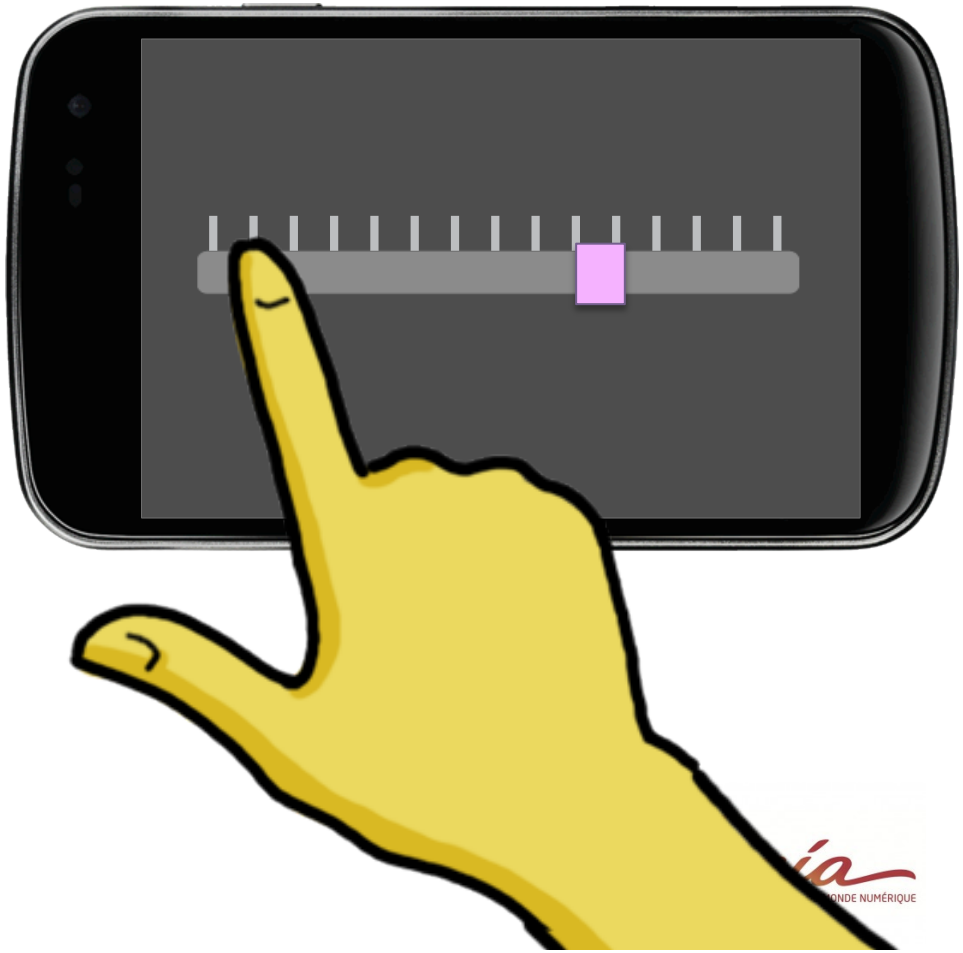

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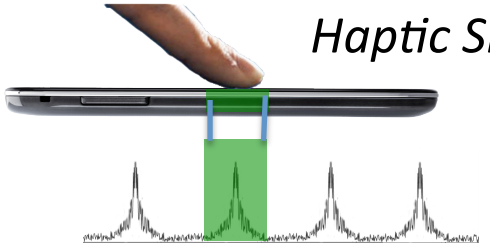
Experimental Protocol

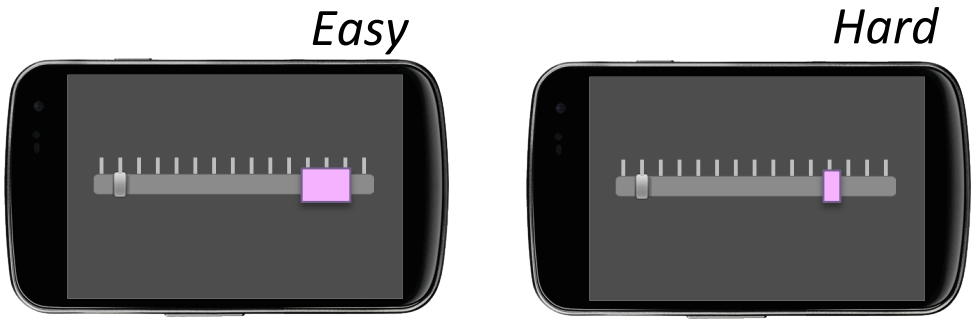
12 participants

Age: 19-35

2 Techniques



2 Difficulties

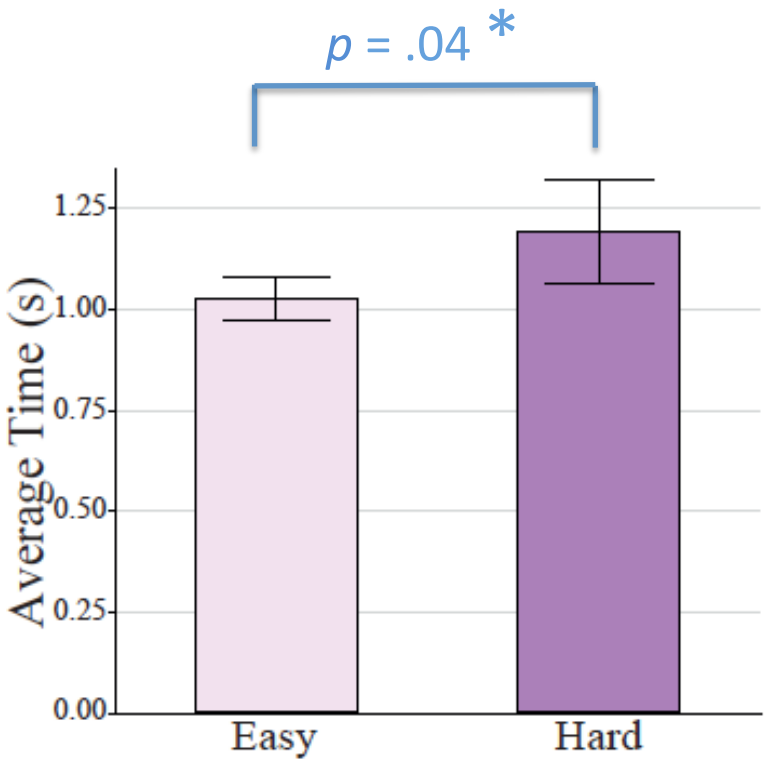


128 repetitions

Completion time

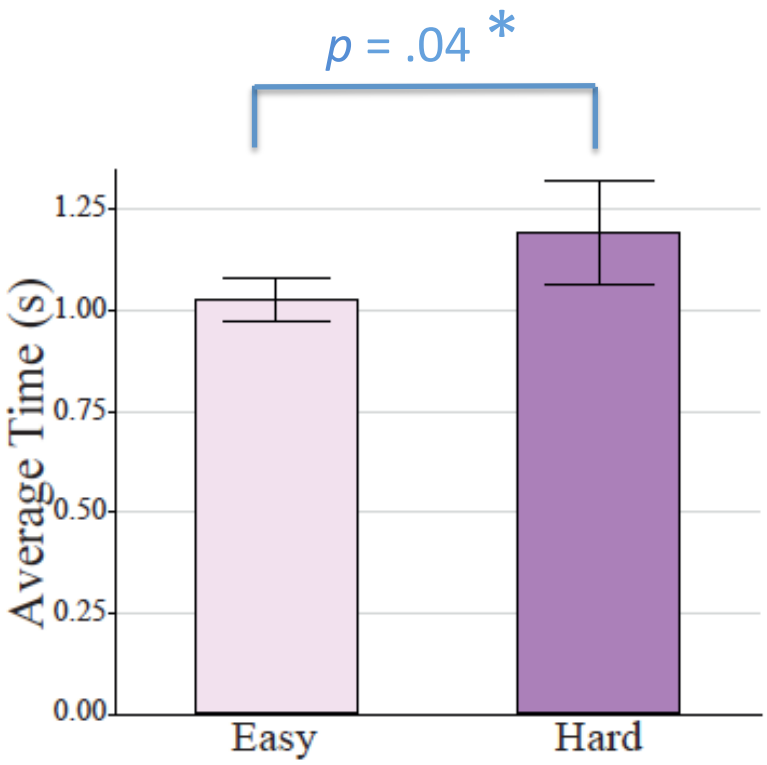
Results

Difficulty



Results

Difficulty

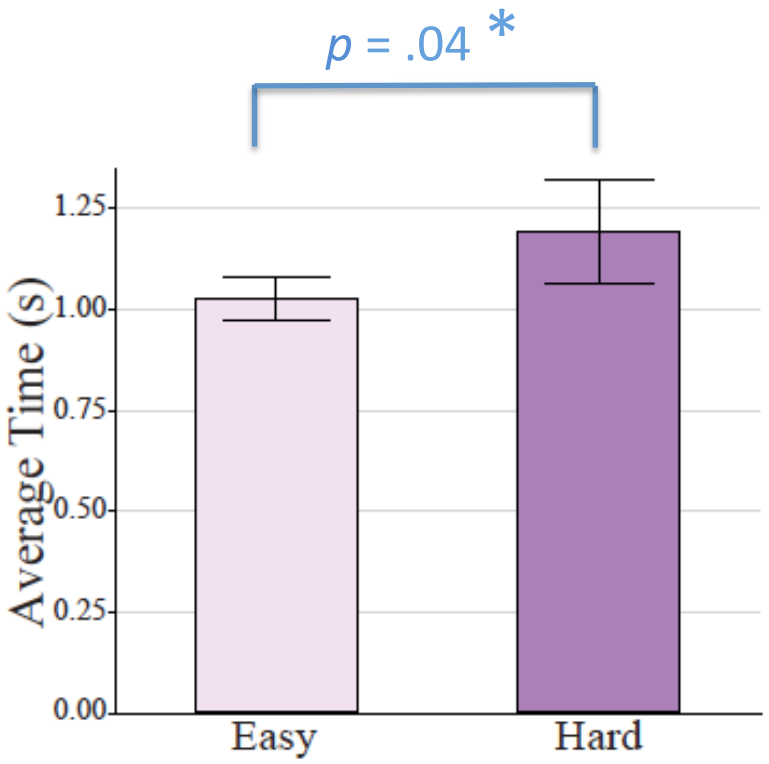


Technique

No significant difference overall (*p* = .17)

Results

Difficulty



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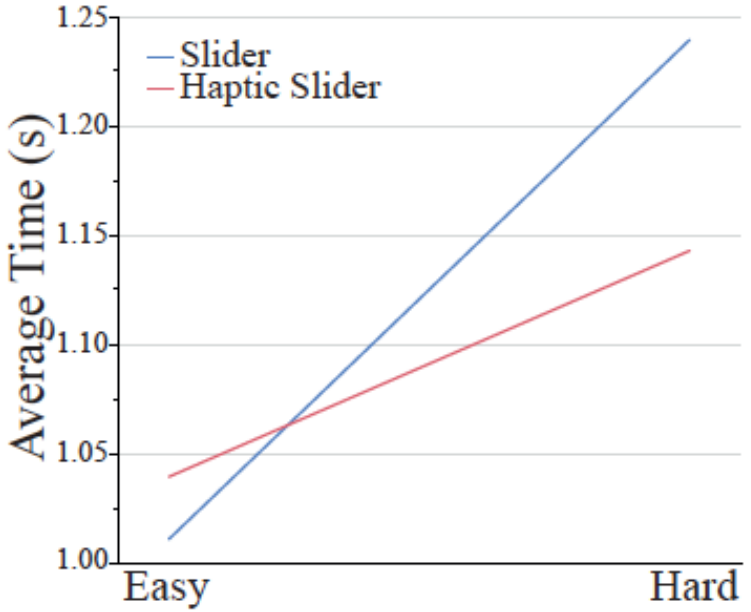
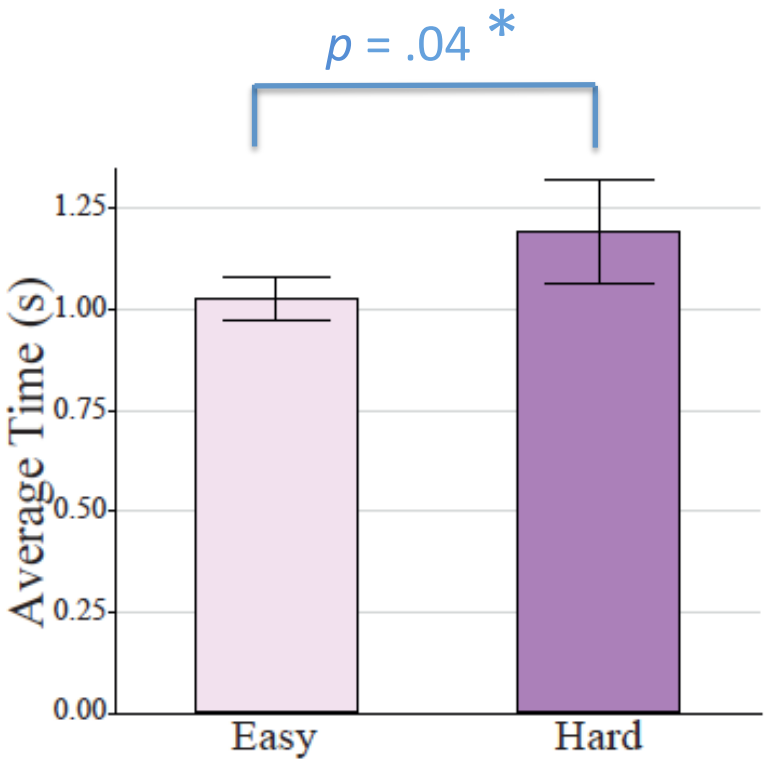
Technique x Difficulty

p = .0006 ***



Results

Difficulty



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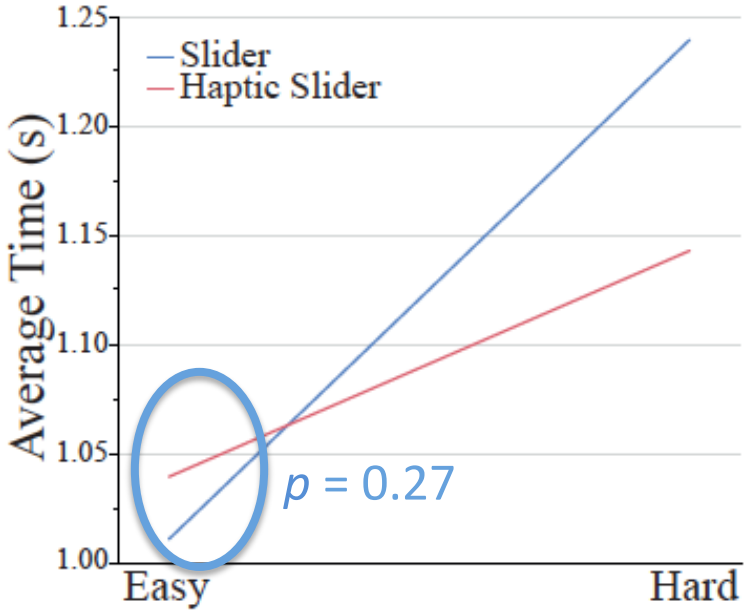
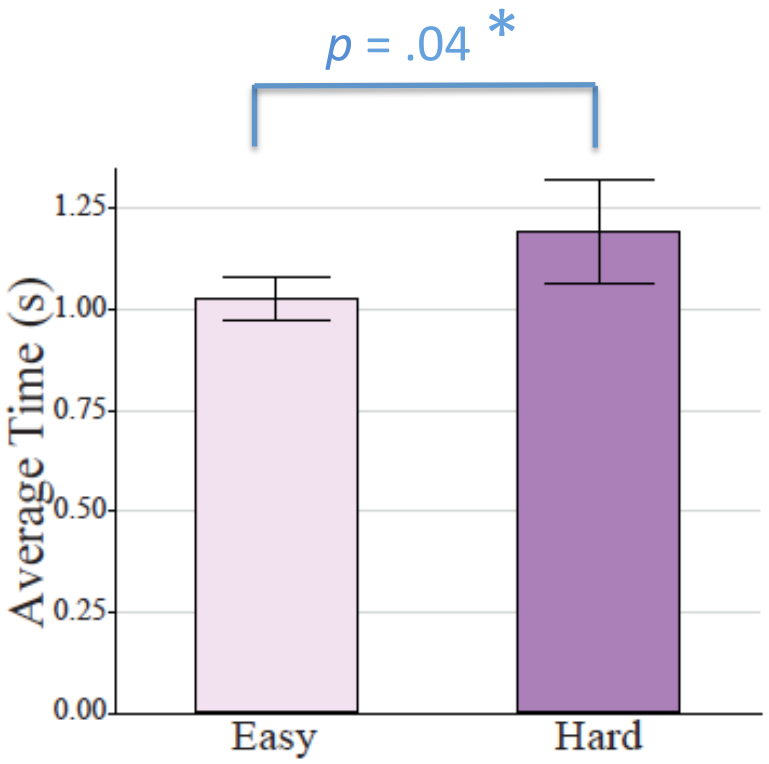


Results

Difficulty



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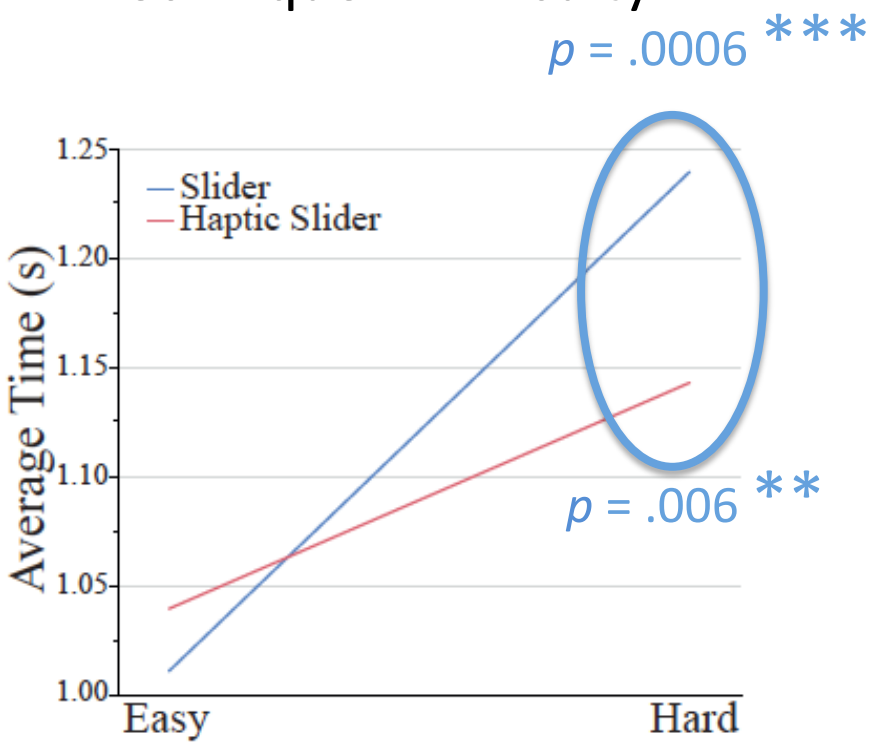
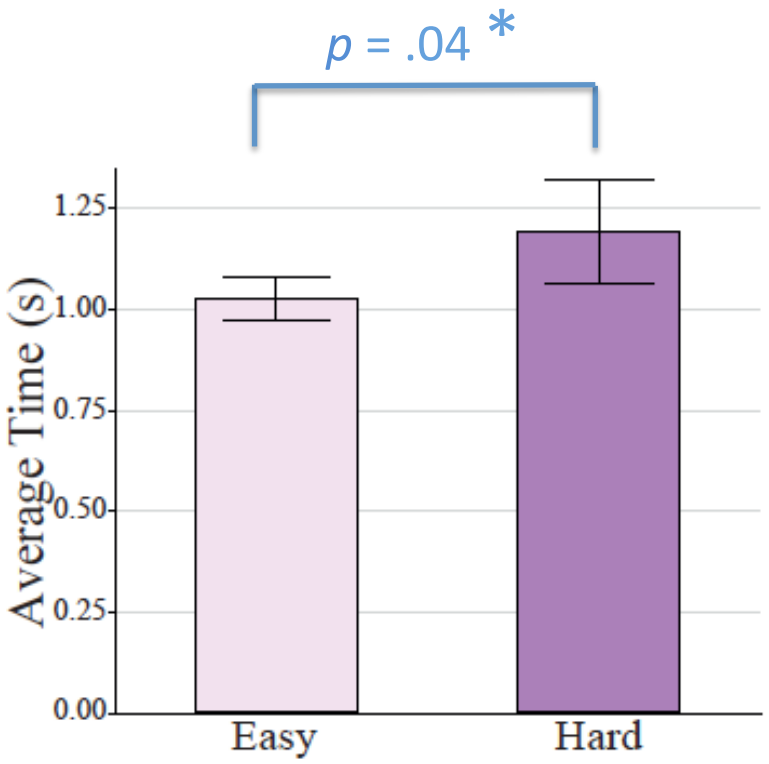


Results

Difficulty



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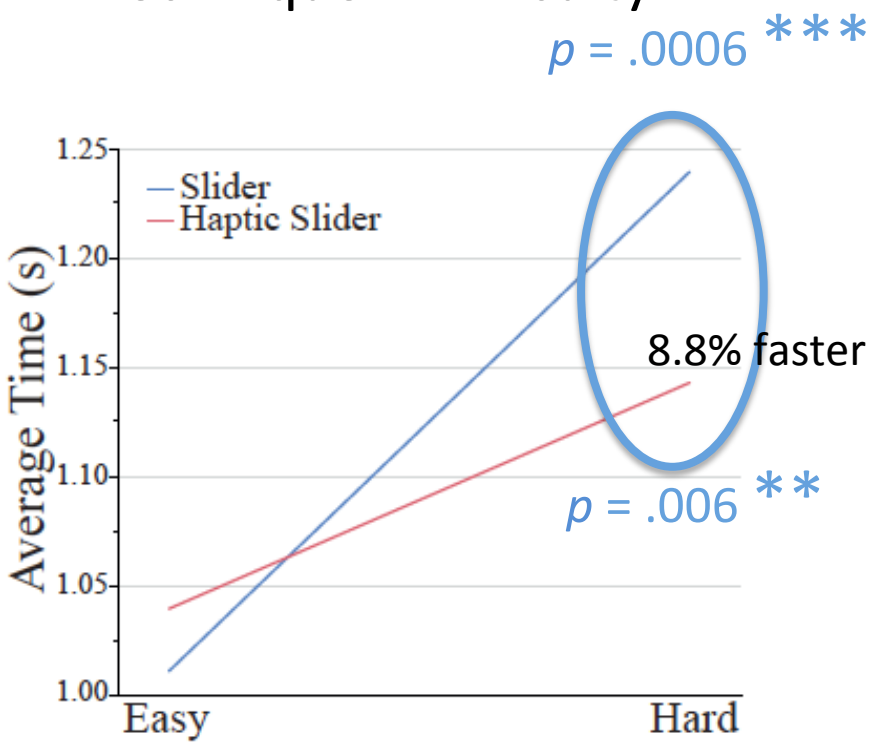
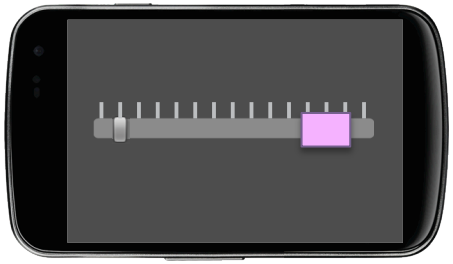
Technique x Difficulty



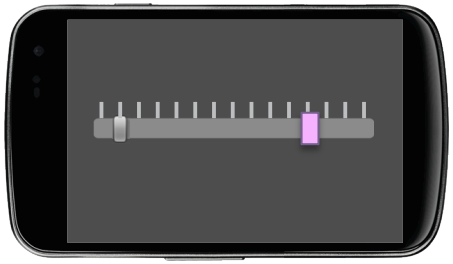
Summary

- *Significant* effect of difficulty
- *Very highly significant* effect of haptic feedback for Hard tasks

Easy



Hard



Summary

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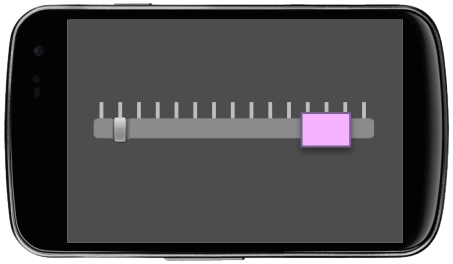
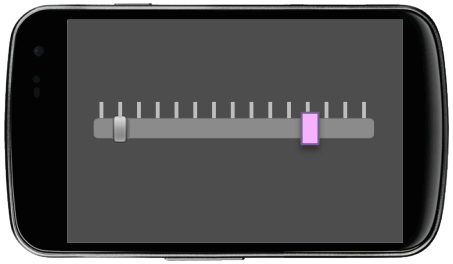


Hard



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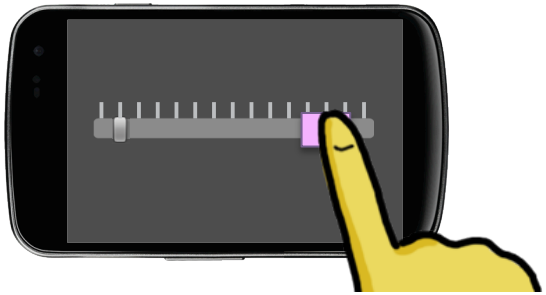
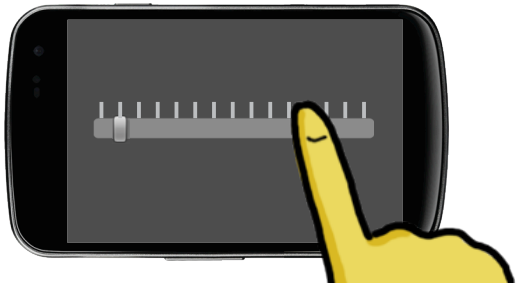
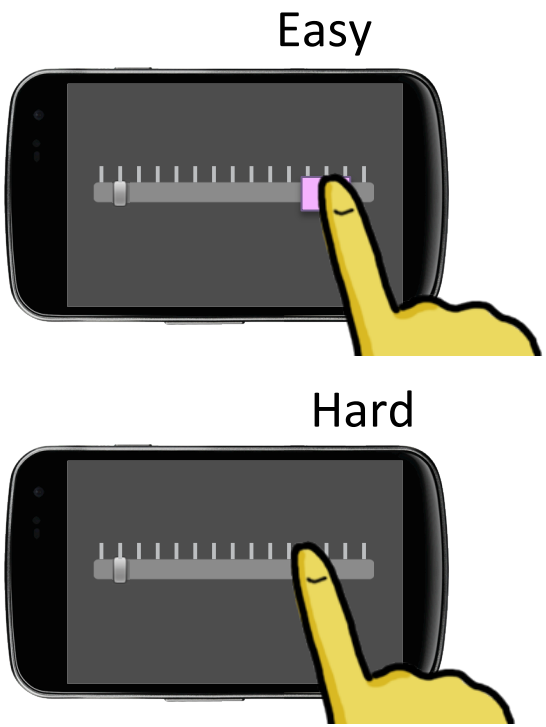


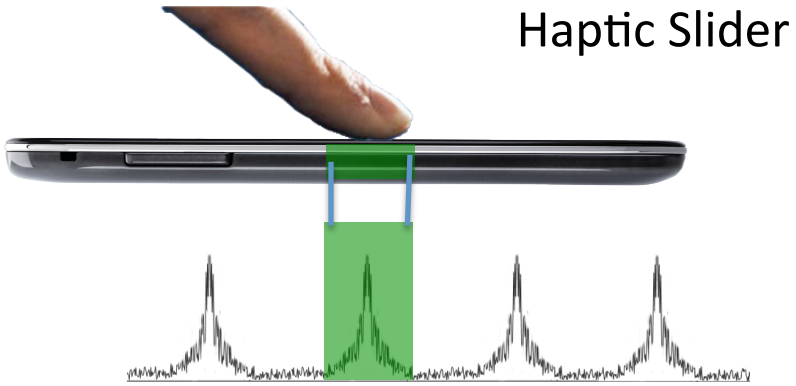
Hard



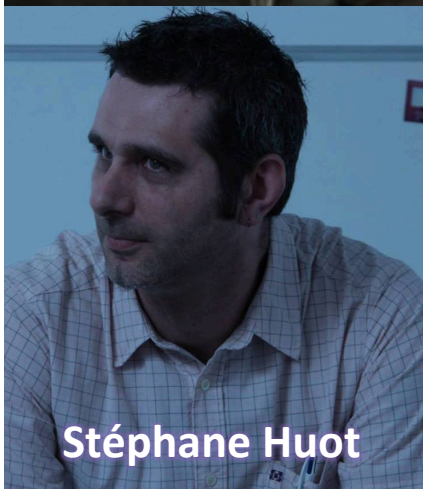
Implications

Haptic feedback facilitates touch slider operation.

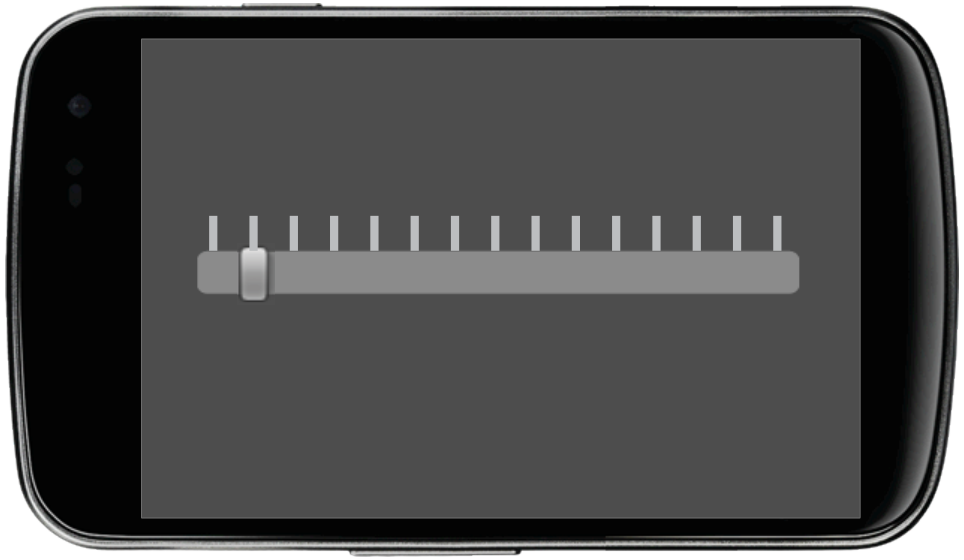




Questions?



A Study of the Effect of Haptic Feedback on Touch Sliders



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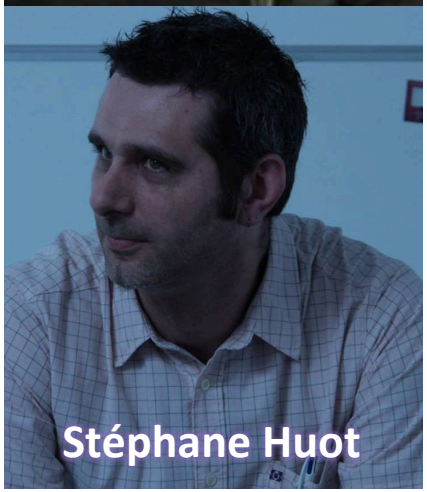

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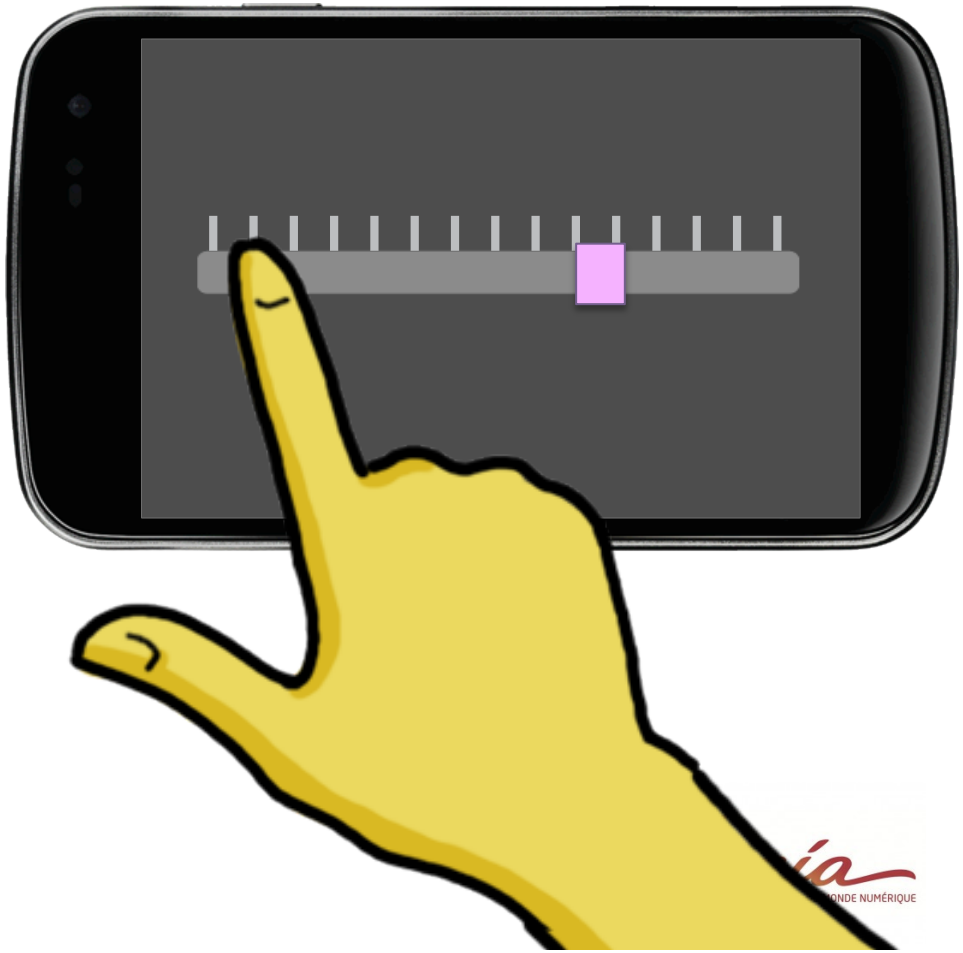

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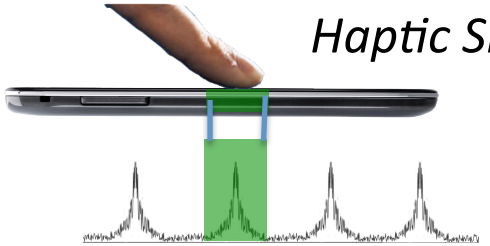
Experimental Protocol

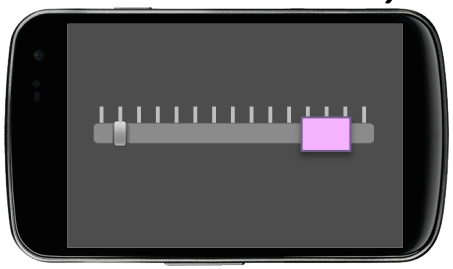
12 participants

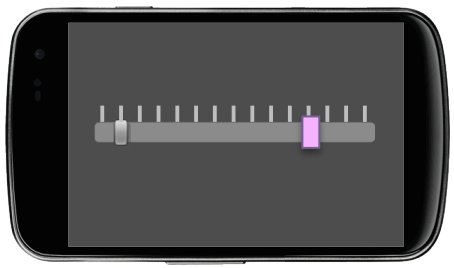
Age: 20-43

2 Techniques



2 Difficulties



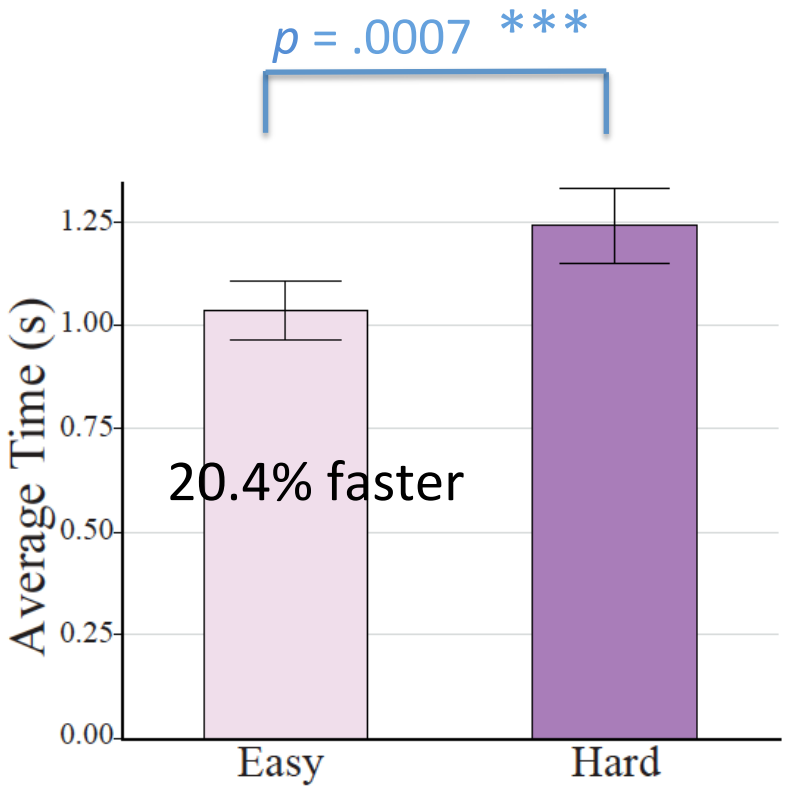


128 repetitions

Completion time

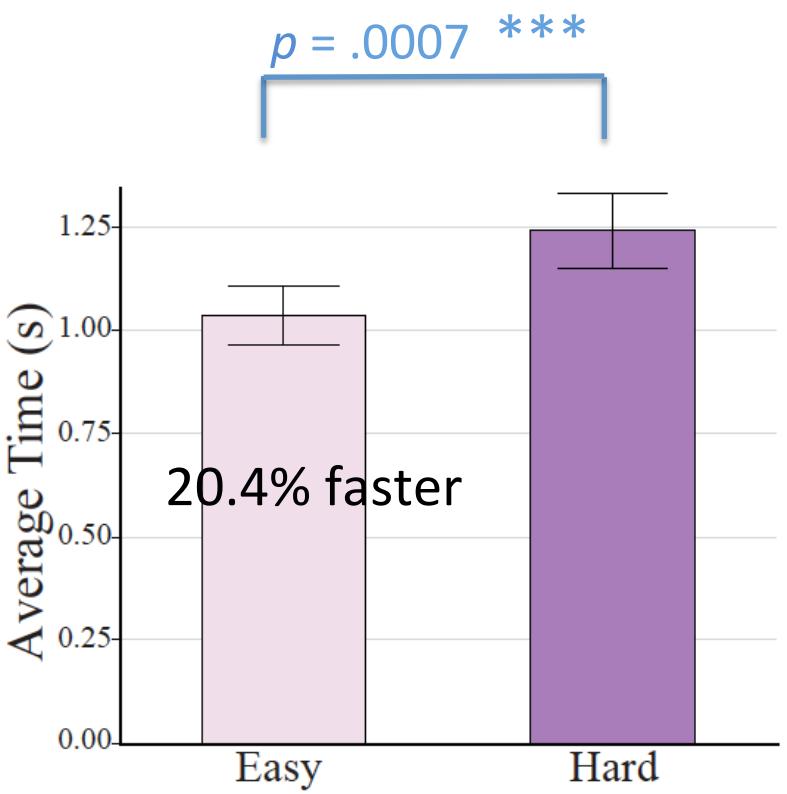
Results

Difficulty

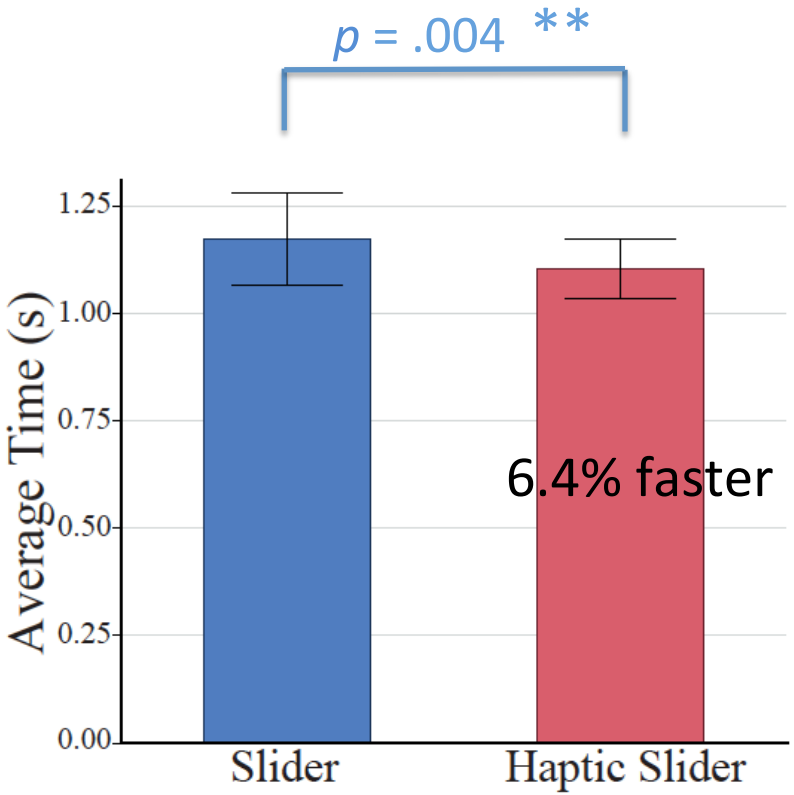


Results

Difficulty

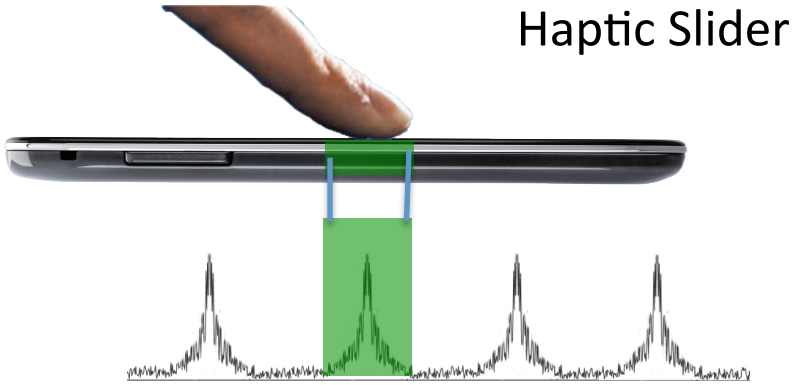


Technique



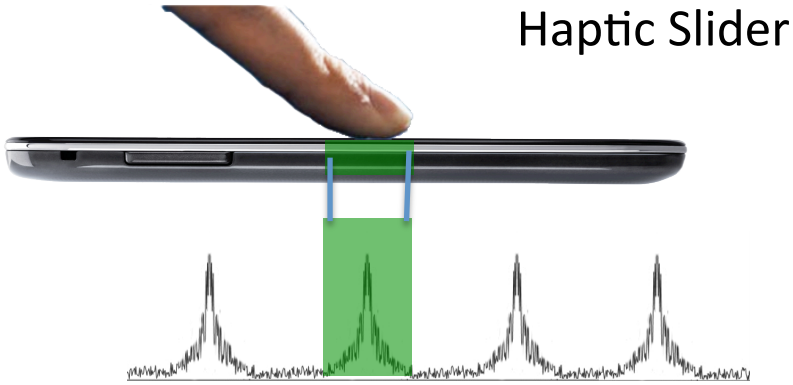
Summary

- *Very highly significant* effect of difficulty (Easy is 20.4% faster)
- *Highly significant* effect of haptic feedback (Haptic Slider is 6.4% faster)

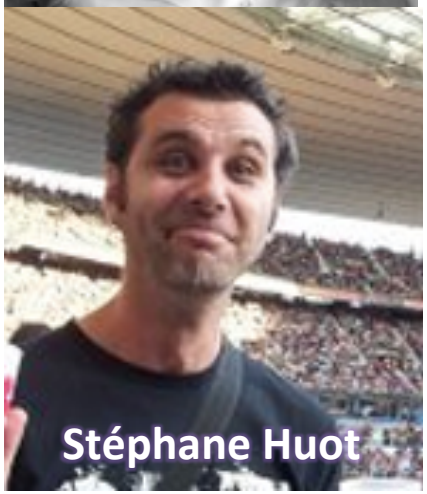


Implications

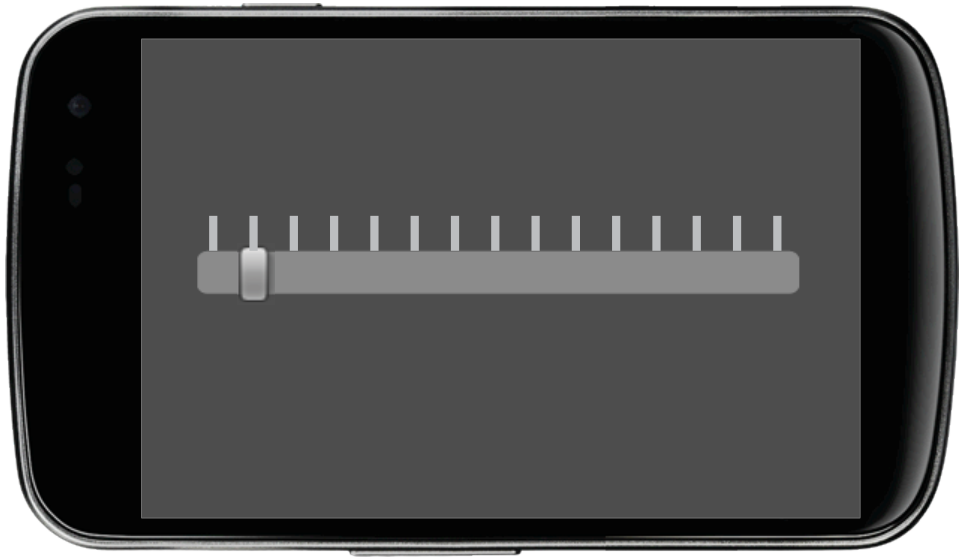
Haptic feedback facilitates touch slider operation for both fine and coarse control.



Questions?



A Study of the Effect of Haptic Feedback on Touch Sliders



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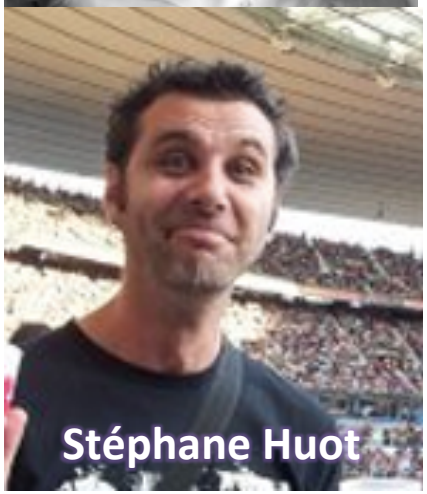

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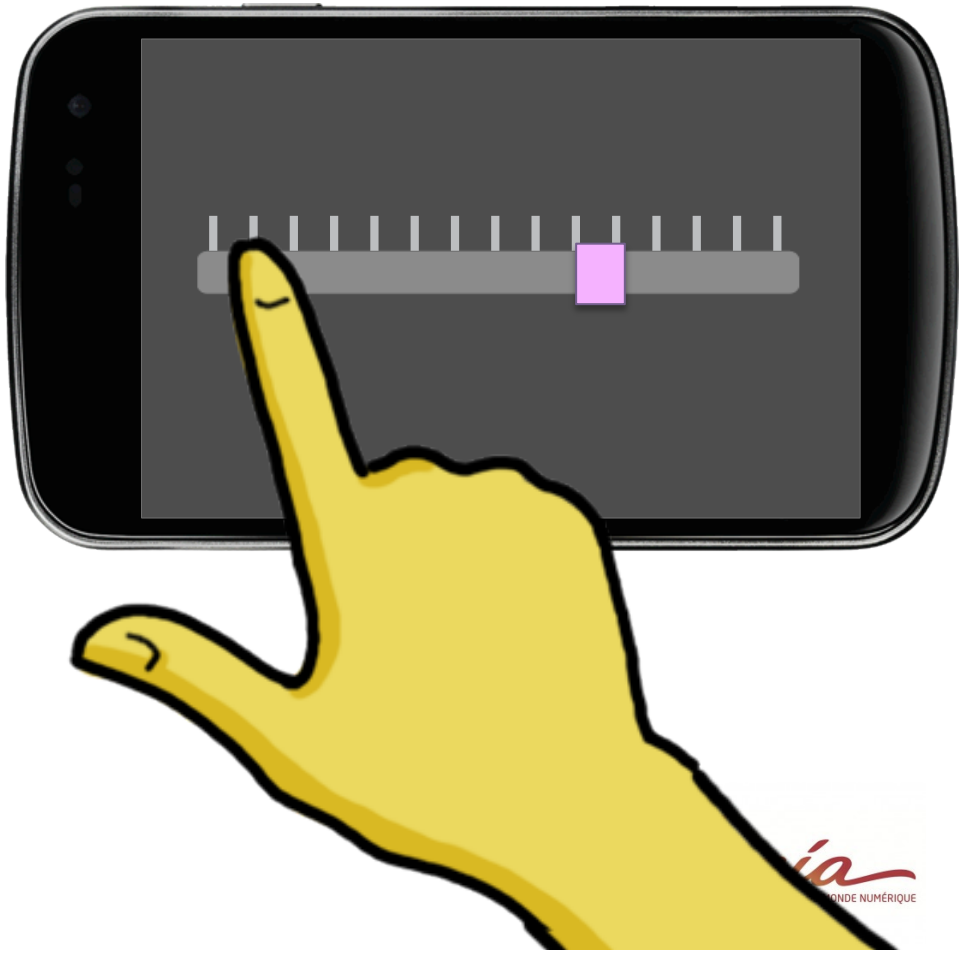

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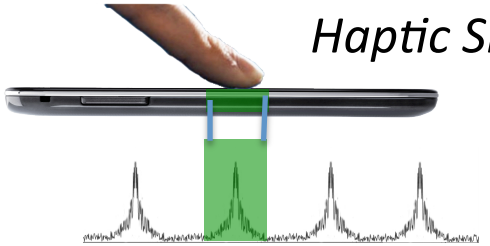
Experimental Protocol

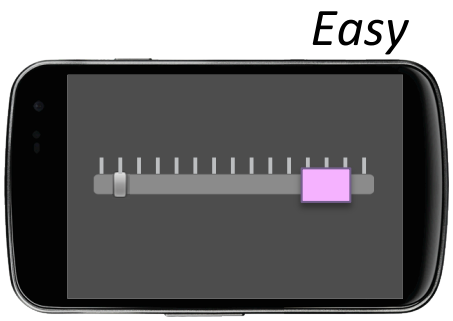
12 participants

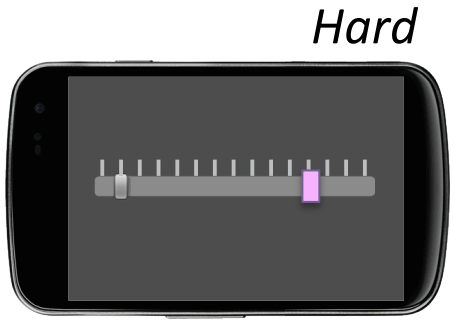
Age: 19-31

2 Techniques



2 Difficulties



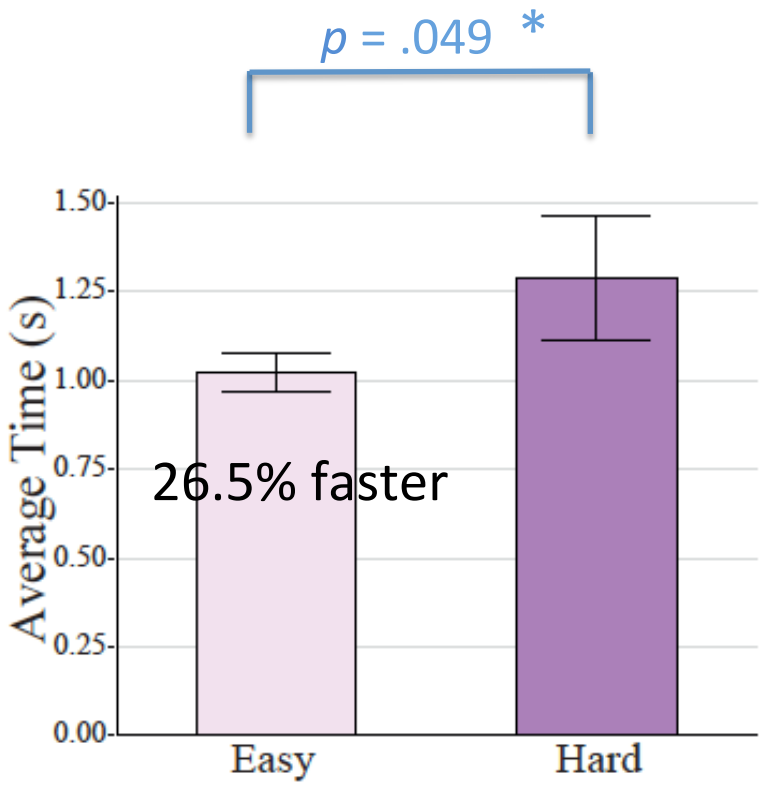


128 repetitions

Completion time

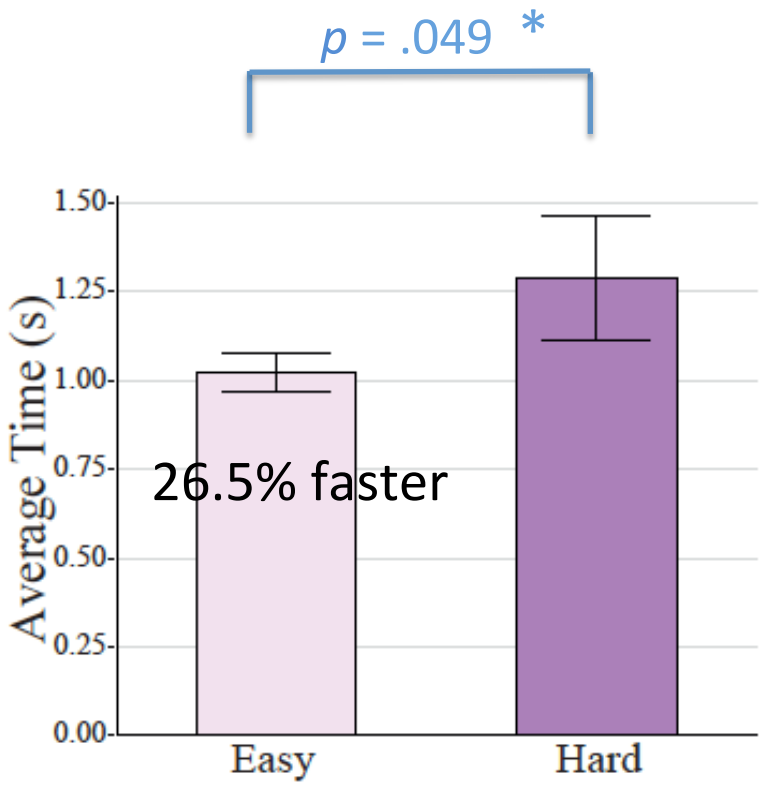
Results

Difficulty



Results

Difficulty

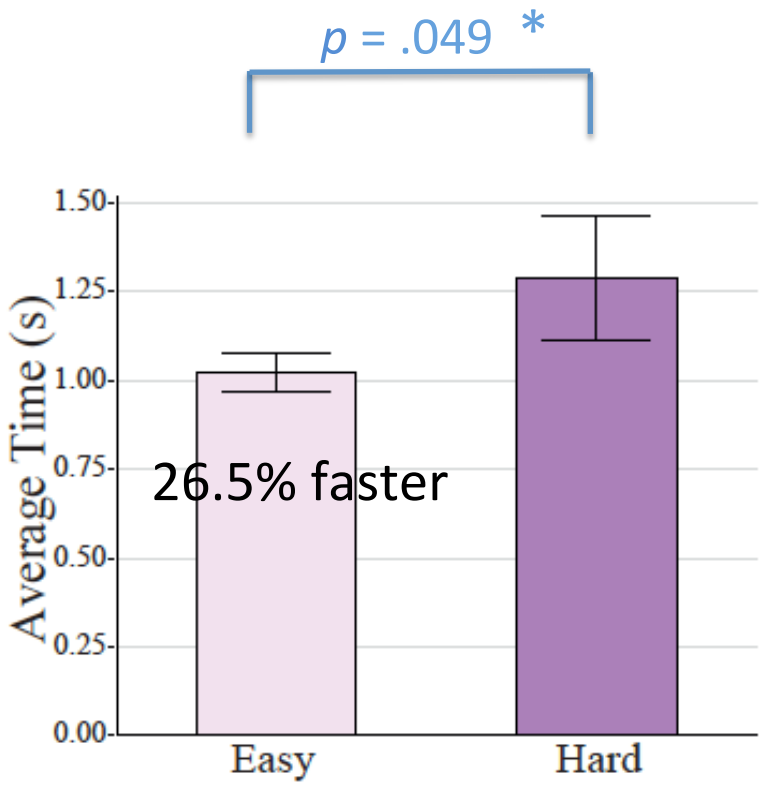


Technique

No significant difference overall (p = .055)

Results

Difficulty



Technique

No significant difference overall (p = .055)

Technique x Difficulty

No interaction

Qualitative feedback

"I find the haptic detents to help me, as it provides some guidance as to where my finger is located on the slider, when I can't see underneath." [P7]

Qualitative feedback

"I find the haptic detents to help me, as it provides some guidance as to where my finger is located on the slider, when I can't see underneath. " [P7]

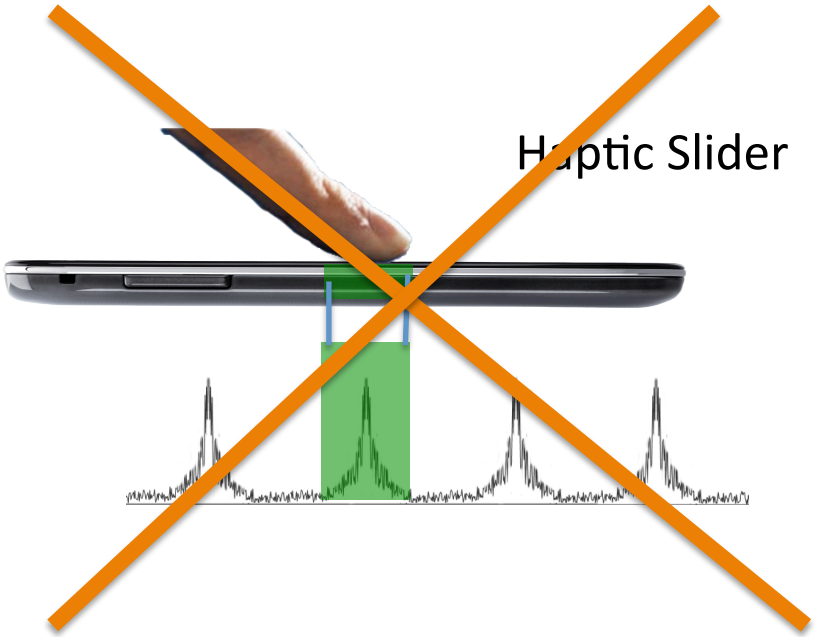
"I don't expect a touch device to provide haptic feedback. When the touch screen started to provide feedback, I initially thought that it was sort of broken." [P2]

Summary

- *Significantly* effect of difficulty
- *No significant* effect of haptic feedback

Implications

Haptic feedback does not help



Questions?

Running an HCI Experiment In Multiple Parallel Universes

All universes were **the same**

Running an HCI Experiment In Multiple Parallel Universes

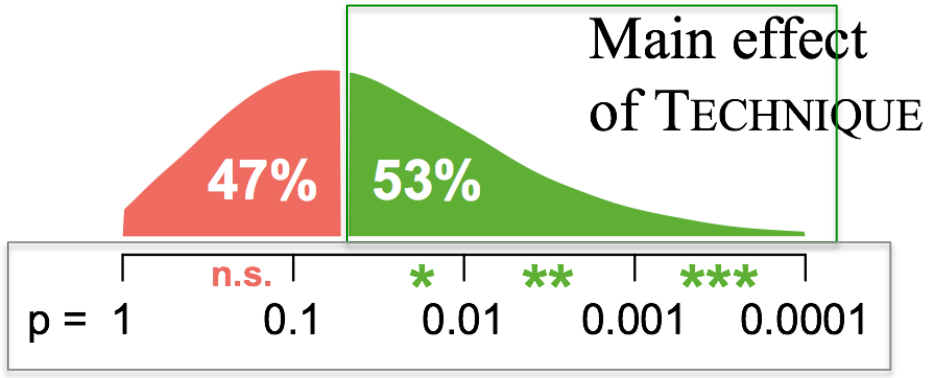
Table 1: ANOVA table.

Source	df	F	Sig.
Technique	1,11	2.1350	0.1719
Difficulty	1,11	5.1621	0.0442*
Technique×Difficulty	1,11	22.6791	0.0006***

Sig.	Sig.	Sig.	Sig.	Sig.
0.0547	0.0040**	0.0317*	0.0212*	0.0977
0.0495*	0.0007***	0.3299	0.0665	0.0031**
0.2030	0.0734	0.0106*	0.0375*	0.0026**

Universe 1 2 3 4 5 6

Running an HCI Experiment In Multiple Parallel Universes



1. *p*-values vary **a lot** across replications

2. Researchers over-rely on *p*-values to report and interpret results

p-values have many other issues

(Links and references on our Web site)

NHST

Null Hypothesis
Significance Testing

“ Anderson, Burnham and Thompson (2000) recently found more than **300 articles** in different disciplines about the indiscriminate use of NHST [...]

After review of the debate about NHST, I argue that the criticisms have sufficient merit to support the **minimization or elimination of NHST**.”

Rex B Kline (2004)

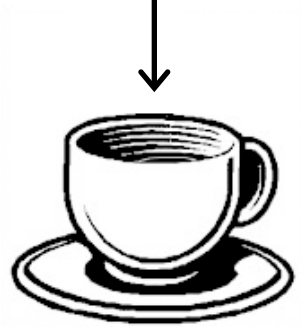
HCI Perspective

End users: us (HCI researchers)

UI: stats methods & tools

Task: produce scientific knowledge

Knowledge



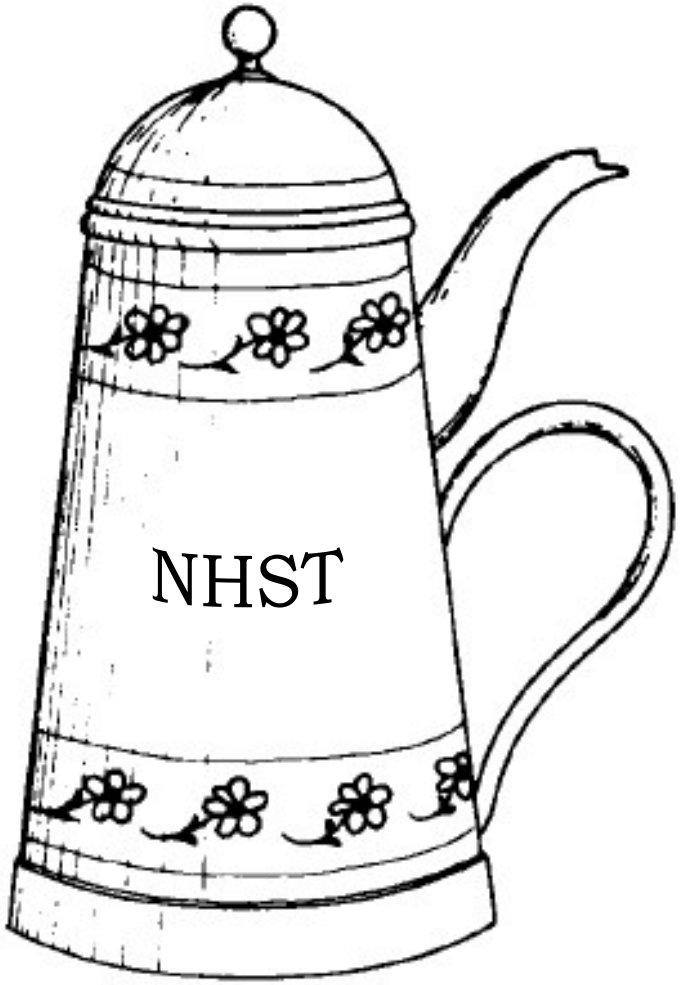
Drawing by Carelman, from Don Norman (1988)

“ The problem is NHST misuse ”

“ The problem is NHST misuse ”


NHST

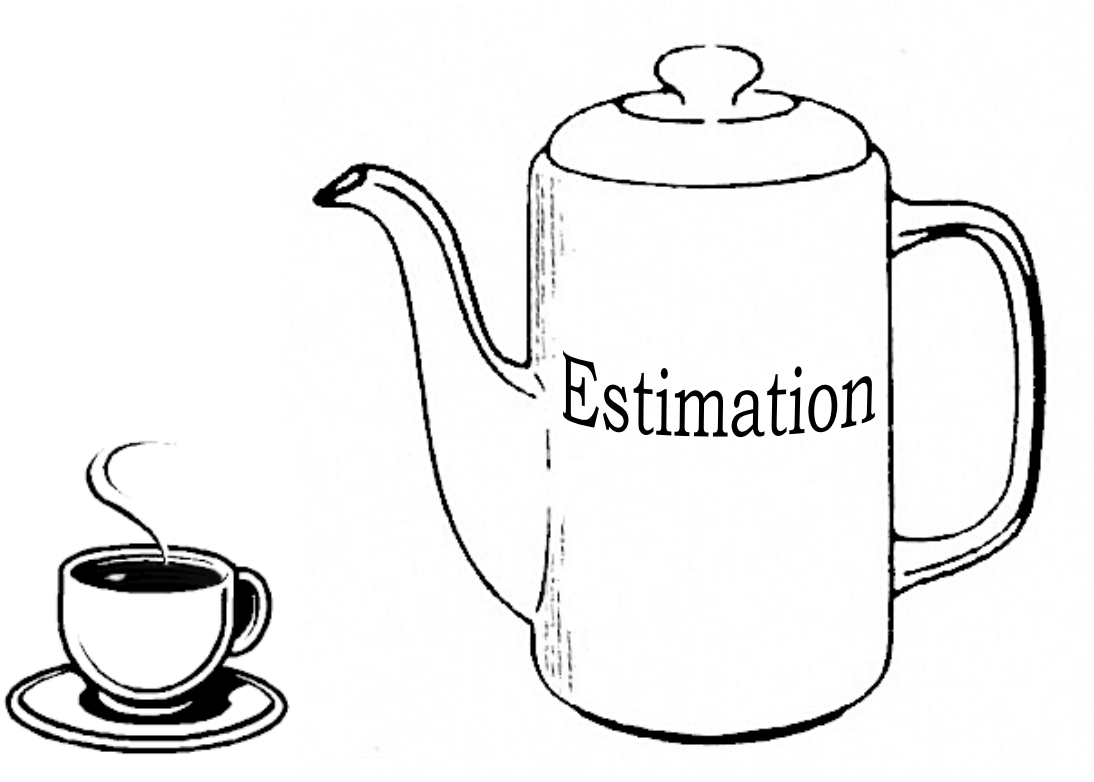
“ We should use more power ”

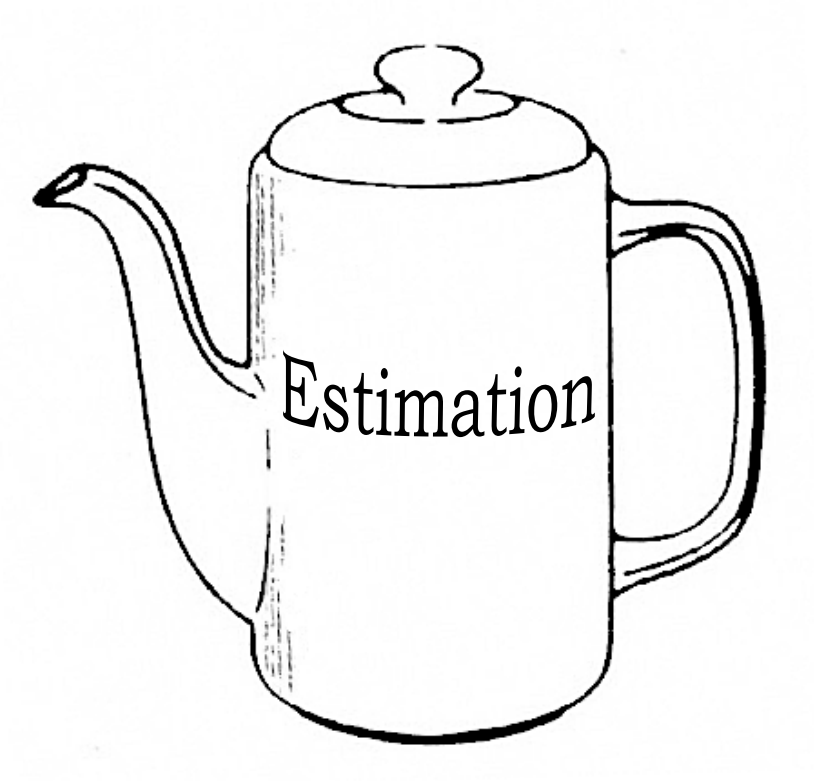



NHST

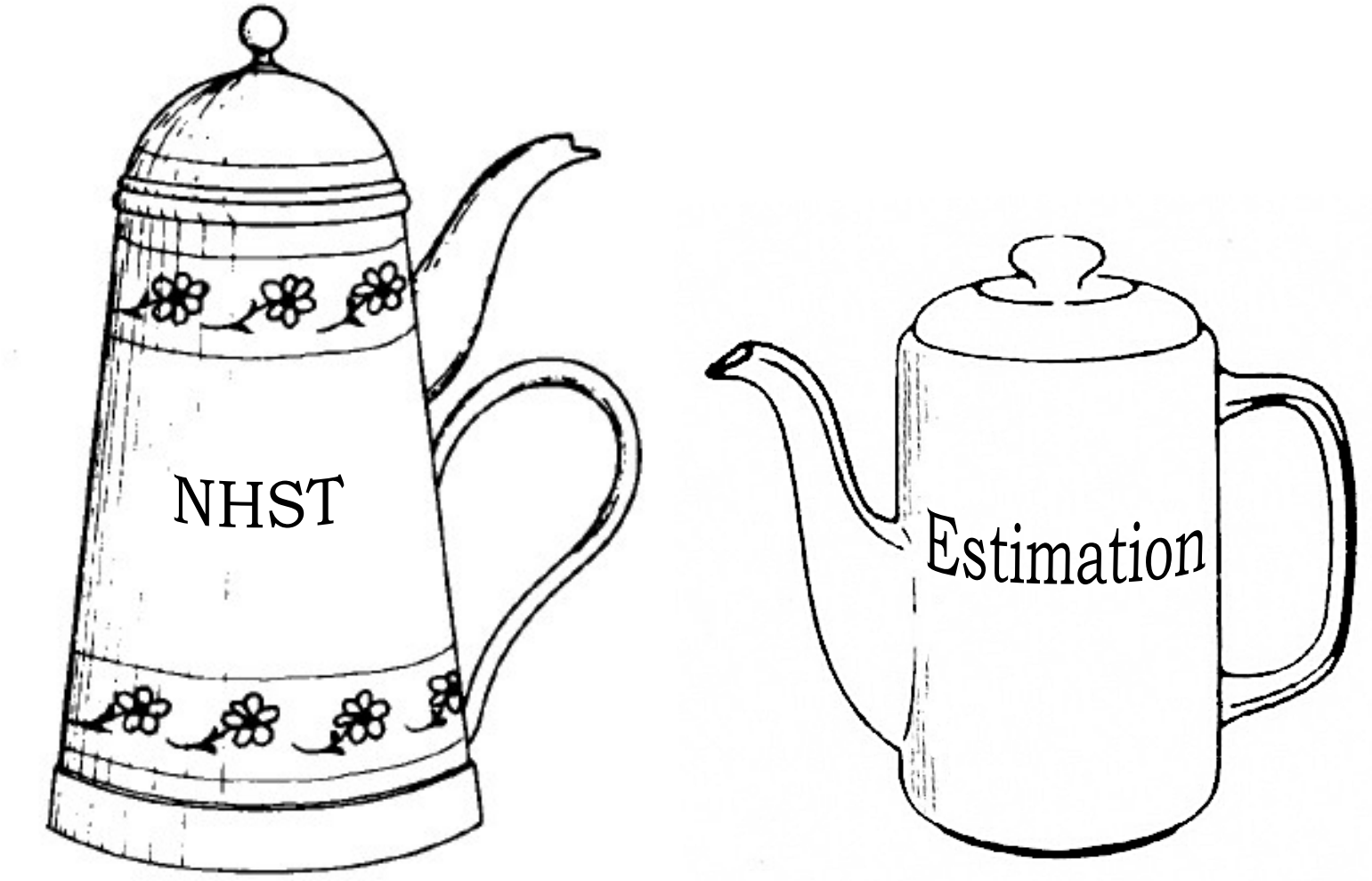
Alternatives

Estimation
(Confidence Intervals)

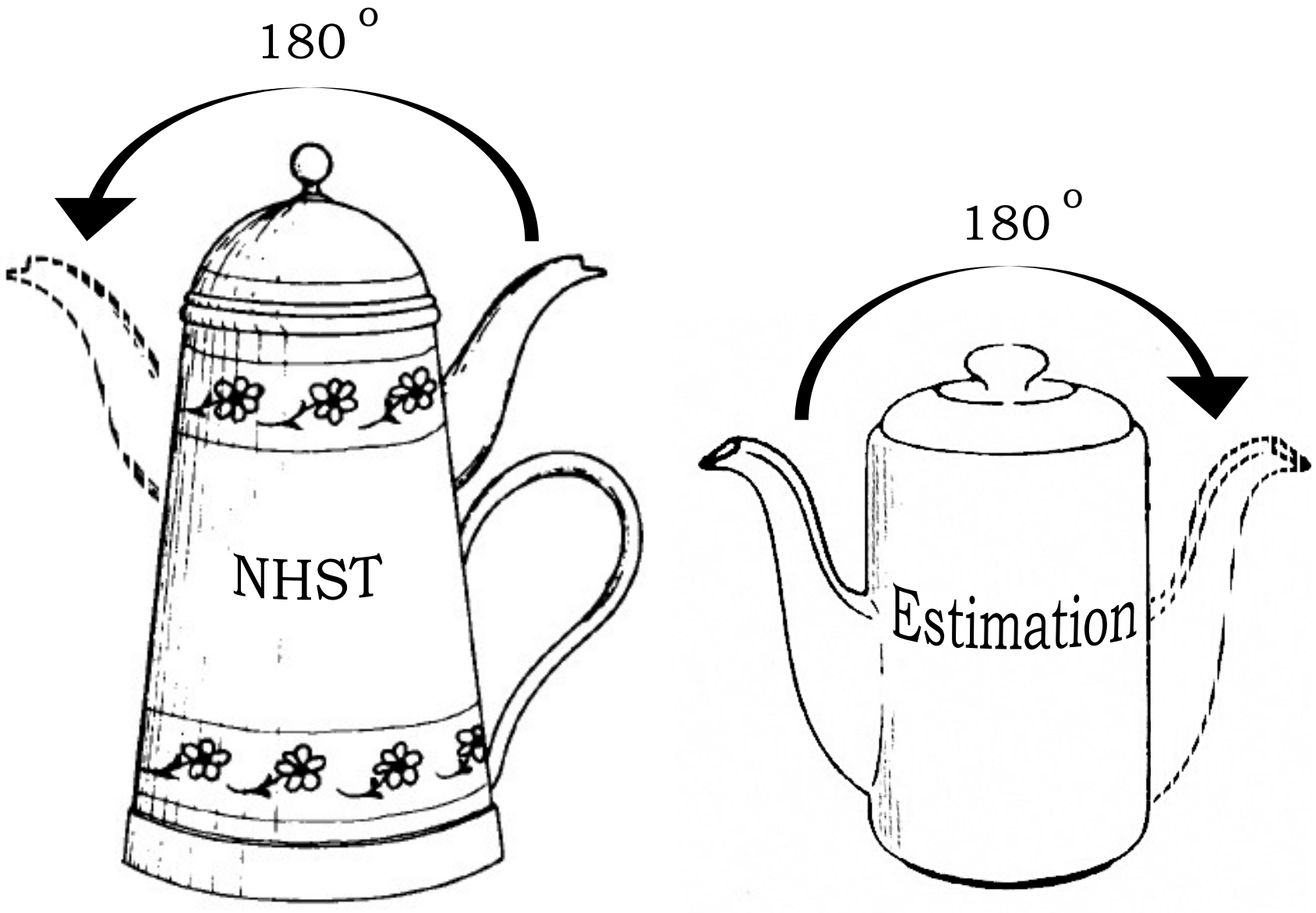



Estimation

Good reasons for not Switching?

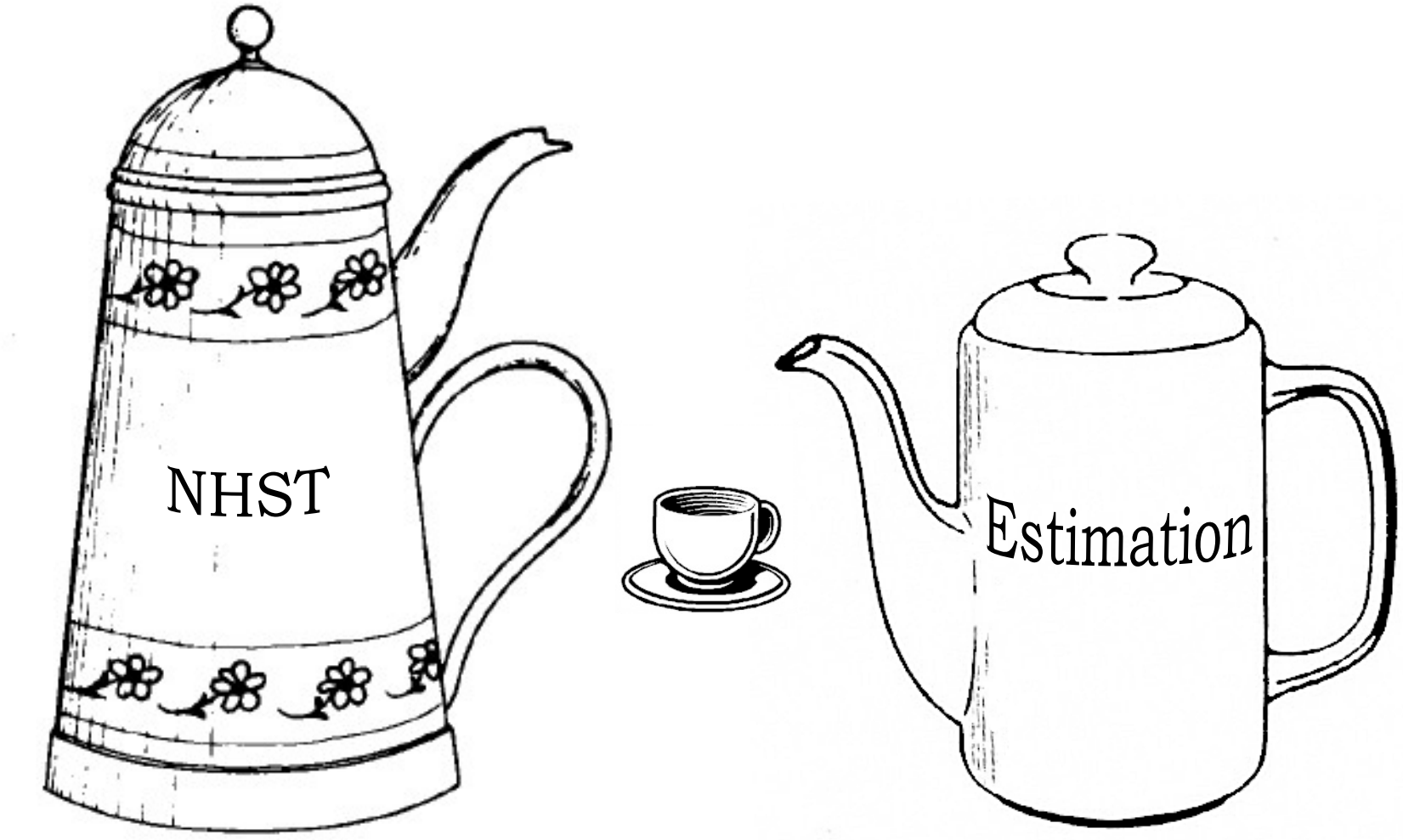


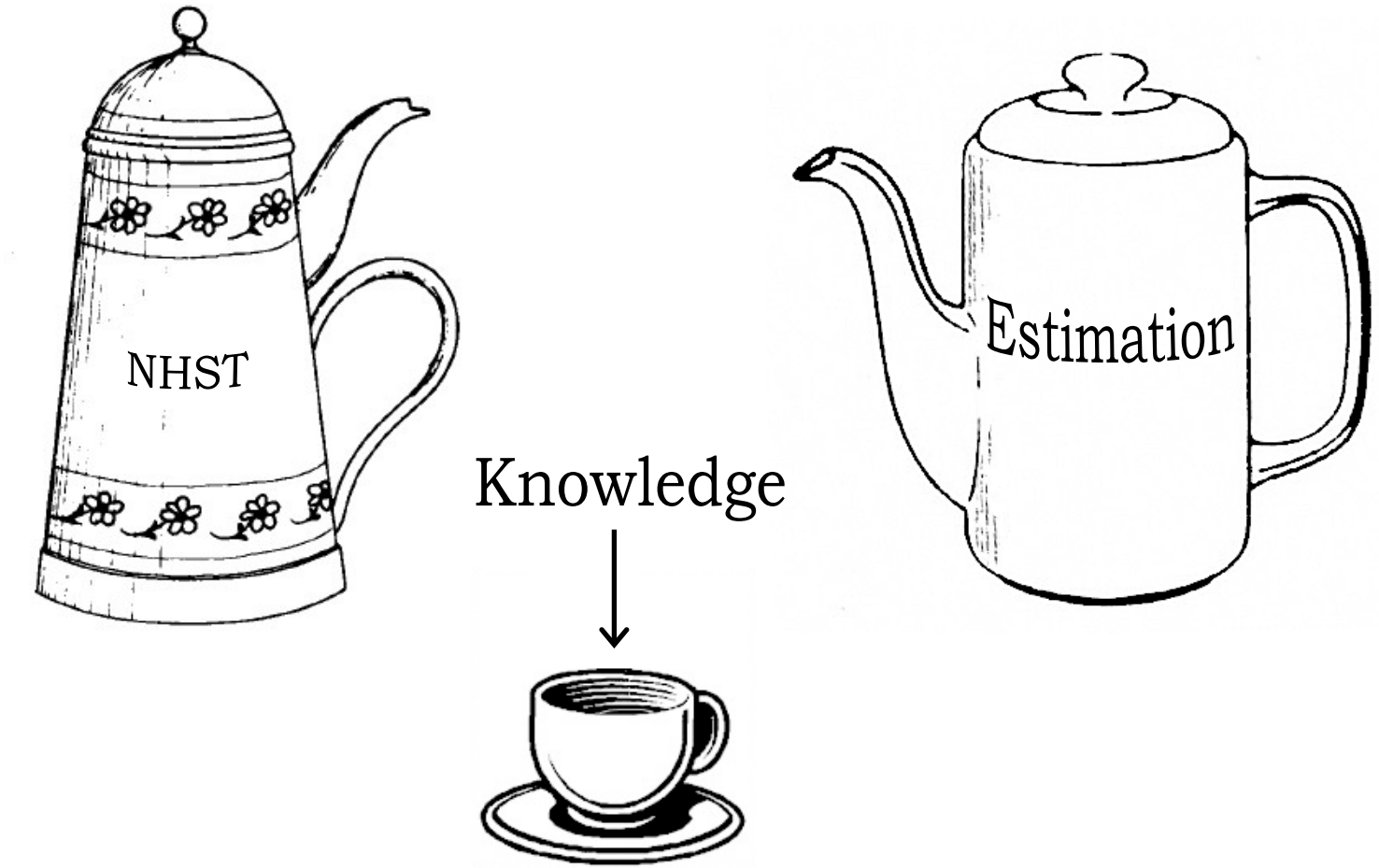
“ The two are equivalent ”

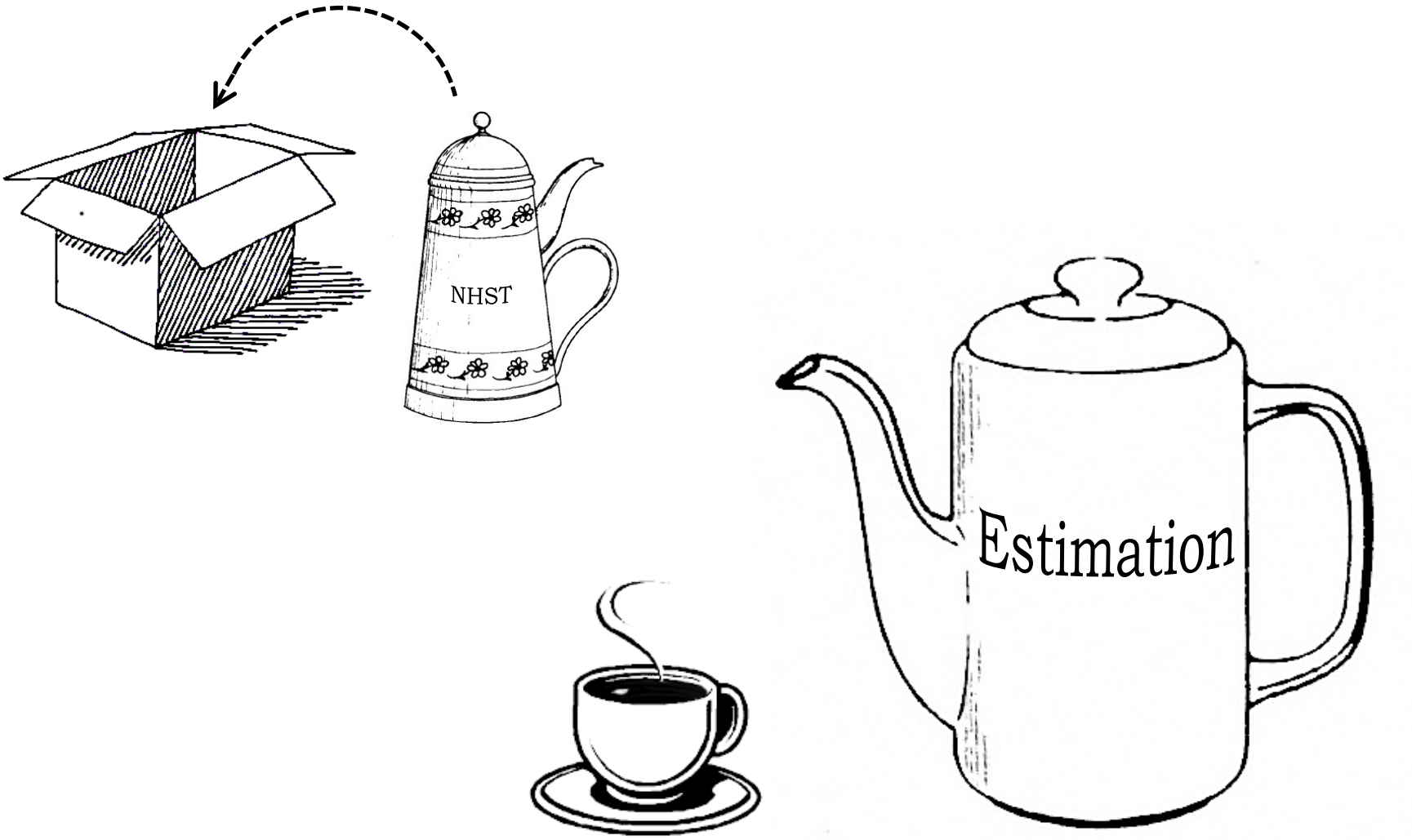


“ We need both ”

“ I don’t know,
I’m not a stats expert ”




NHST
Knowledge
Estimation


NHST
Estimation

For links
and references:

www.aviz.fr/parallel