Psychophysical scaling reveals a unified theory of visual memory strength

Schurgin, Wixted, Brady (2020)

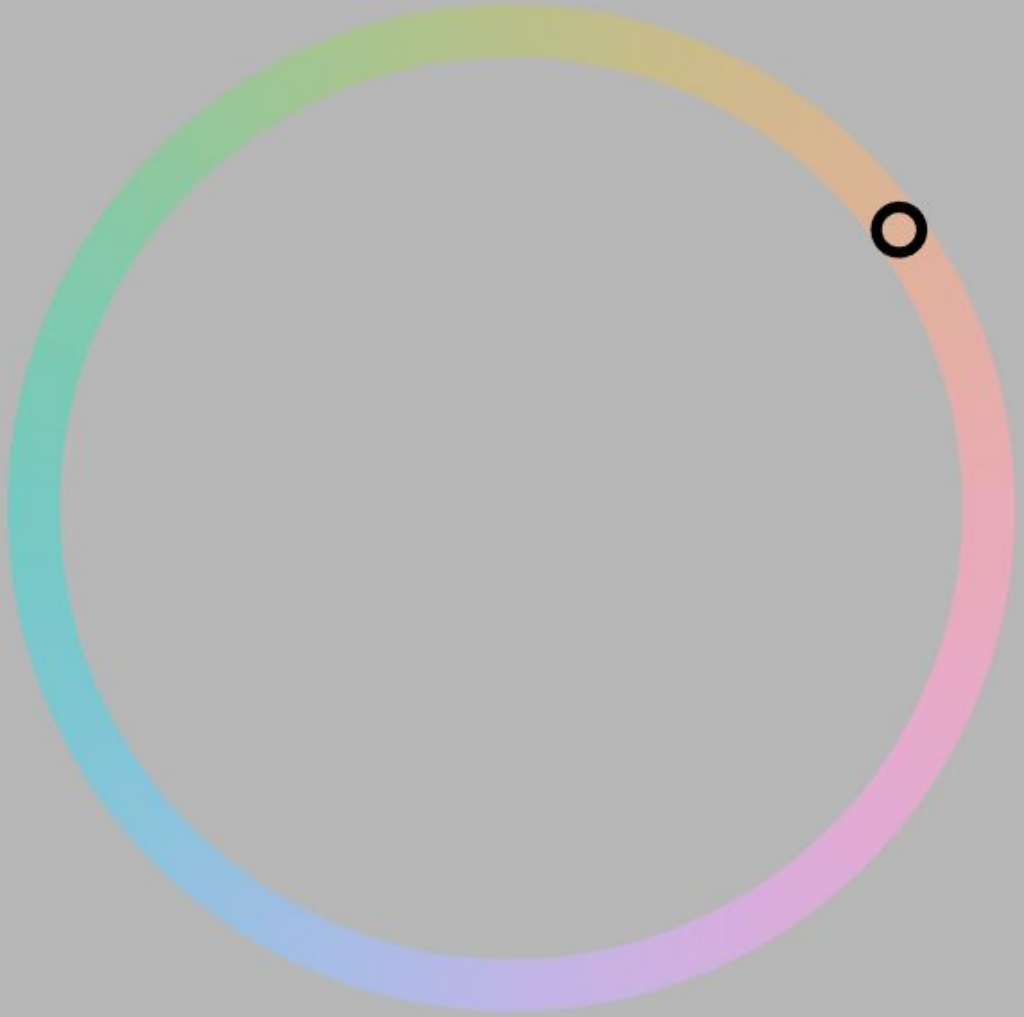
https://doi.org/10.1038/s41562-020-00938-0

Presented by Danny Garside on 20221130 at the LSR journal club

Cue

Choice

Choice



Modelling - a “mixture model”

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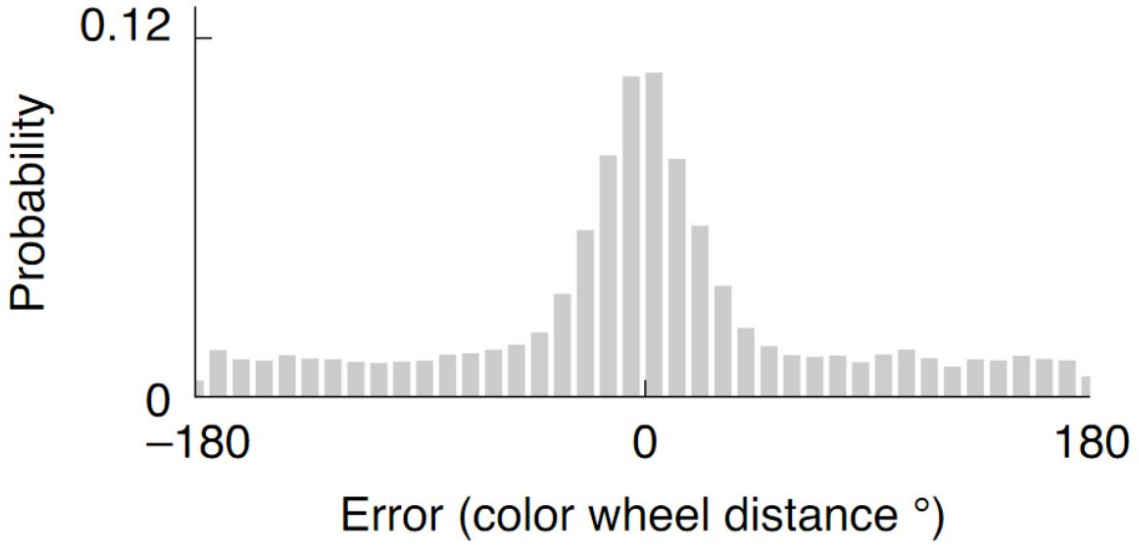
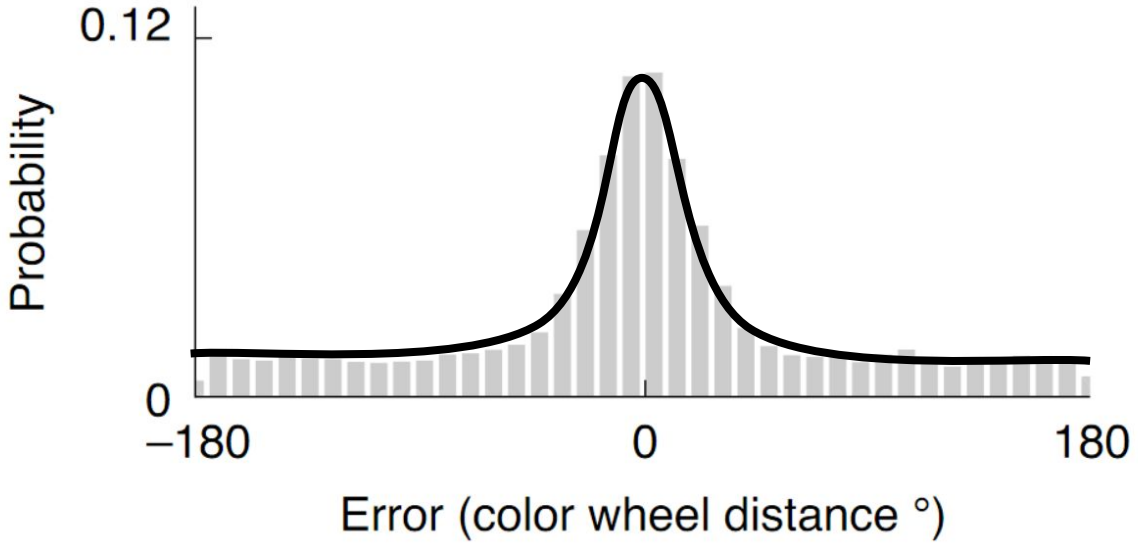


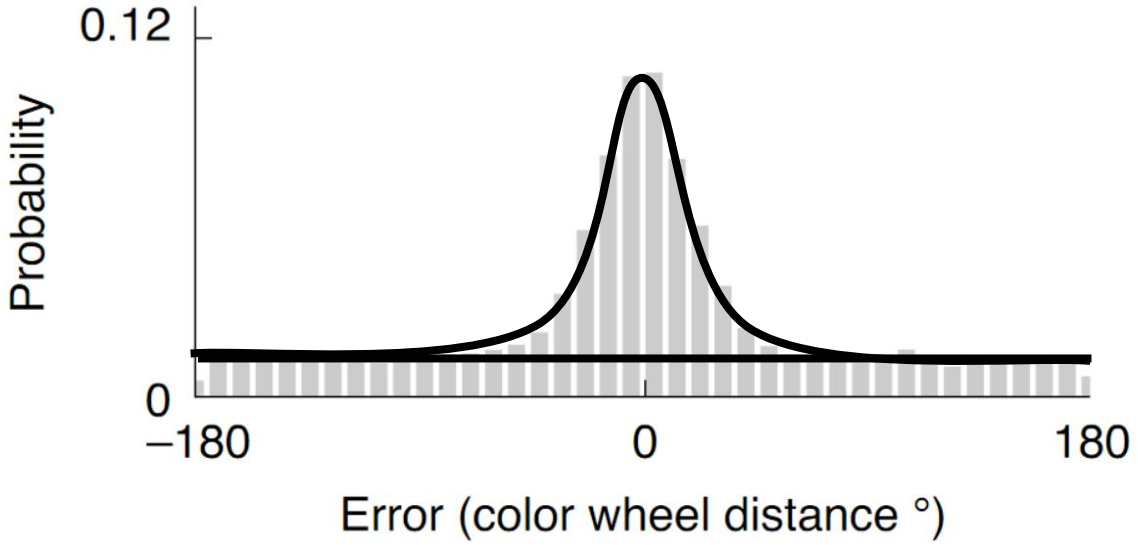
F1B

Modelling - a “mixture model”



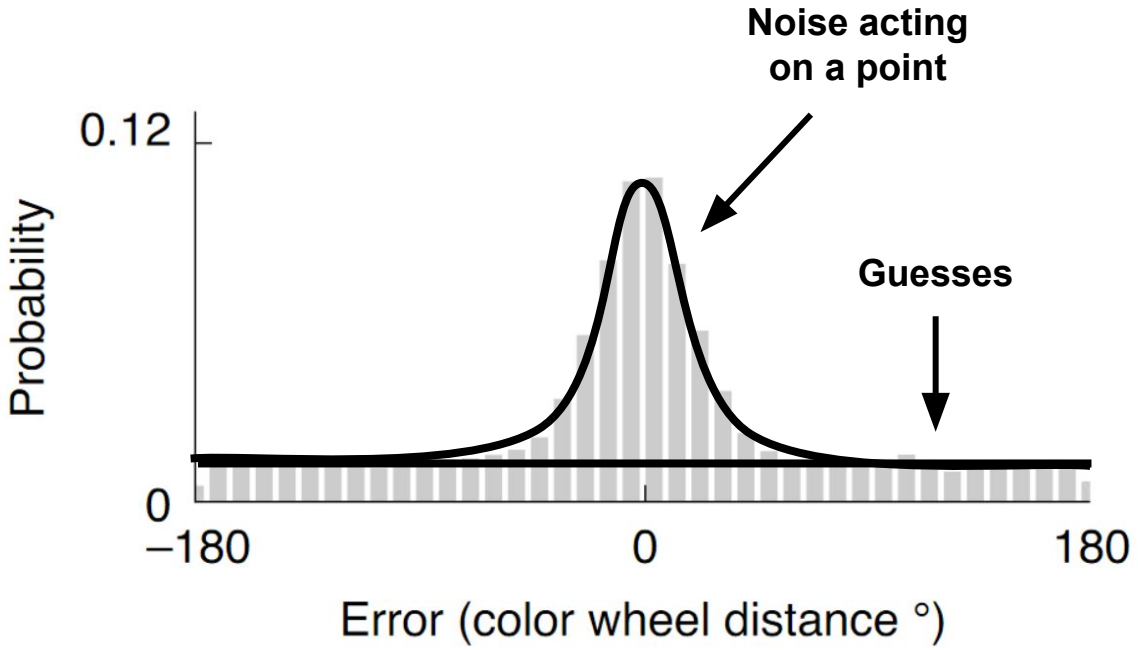
F1B

Modelling - a “mixture model”



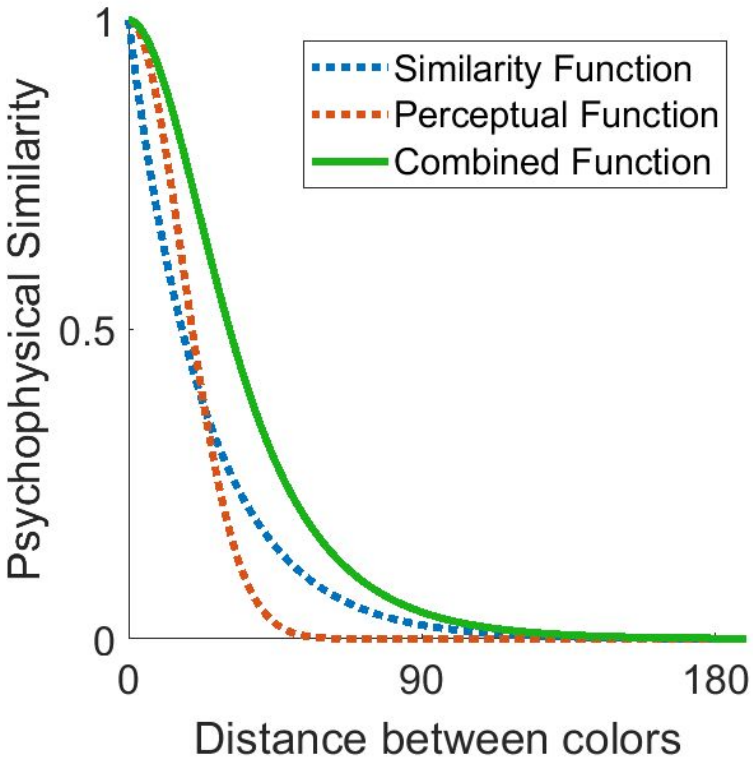
F1B

Modelling - a “mixture model”



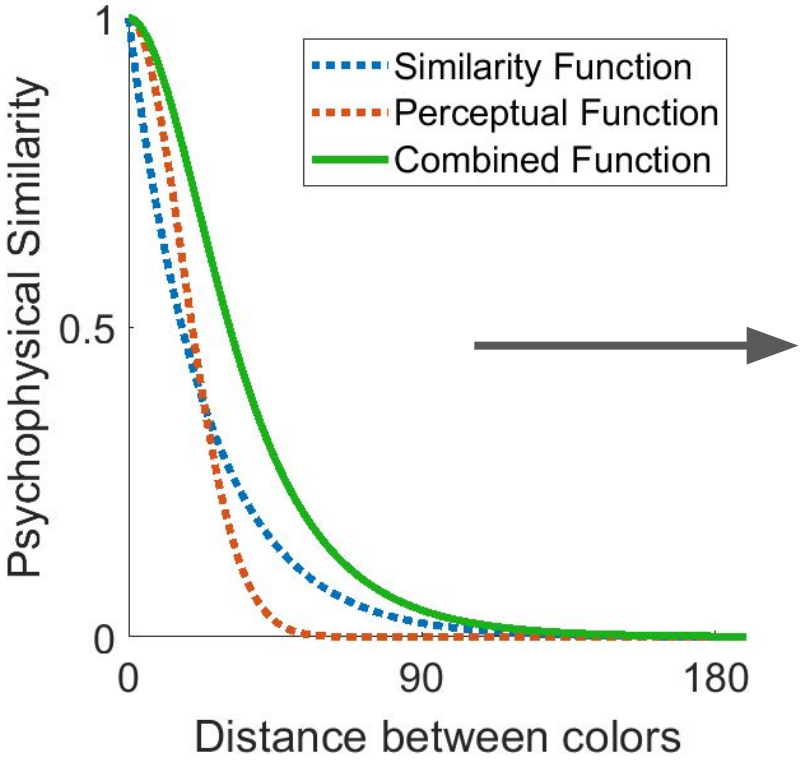
F1B

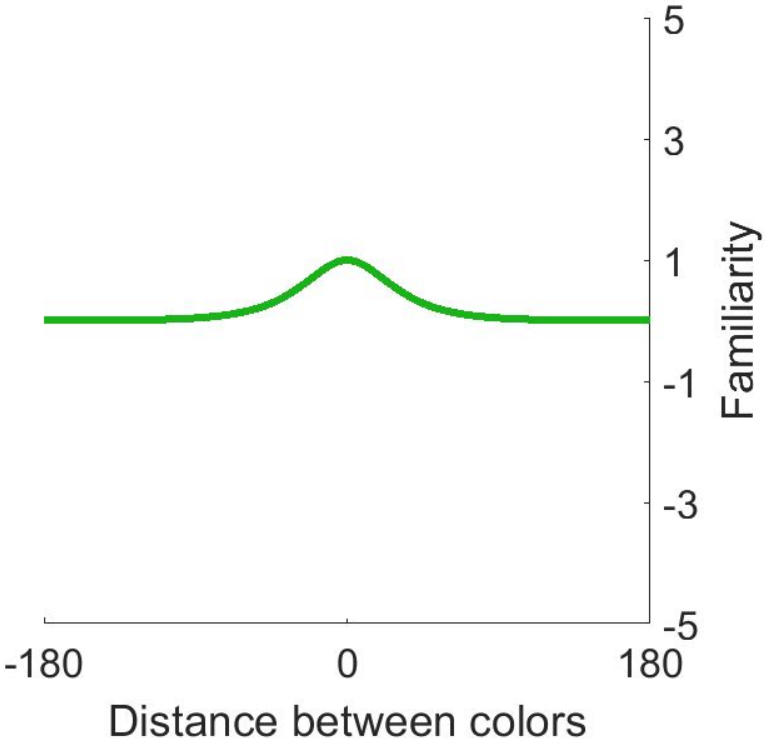
Modelling - TCC model



Based on F1F

Modelling - TCC model

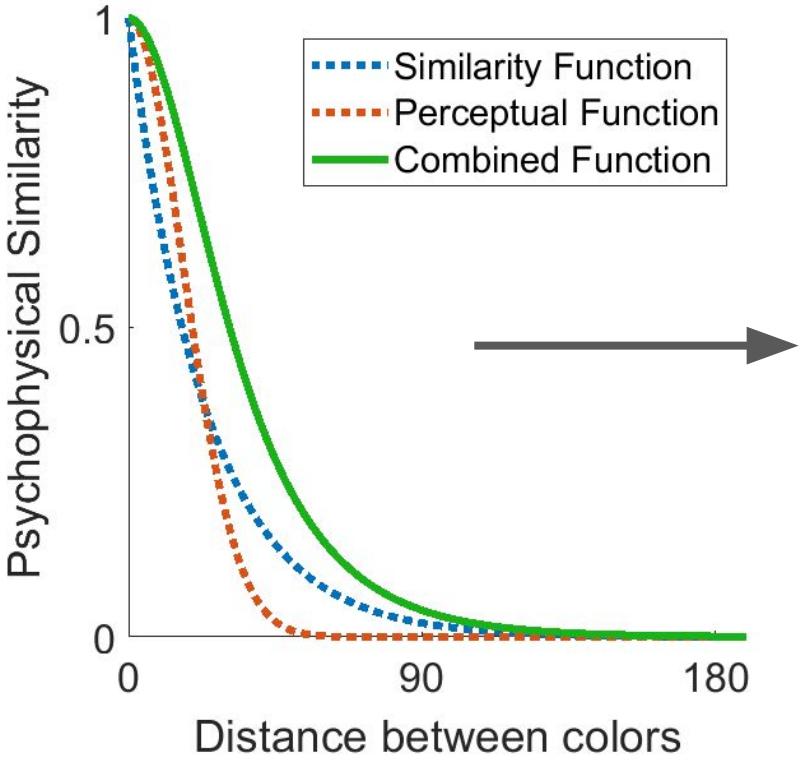


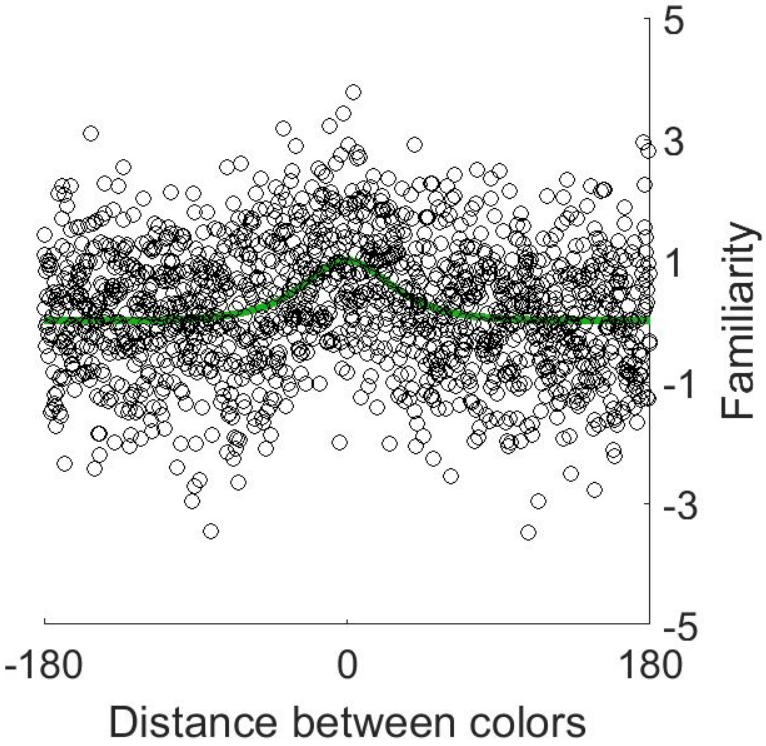


Based on F1F

Based on F2B

Modelling - TCC model

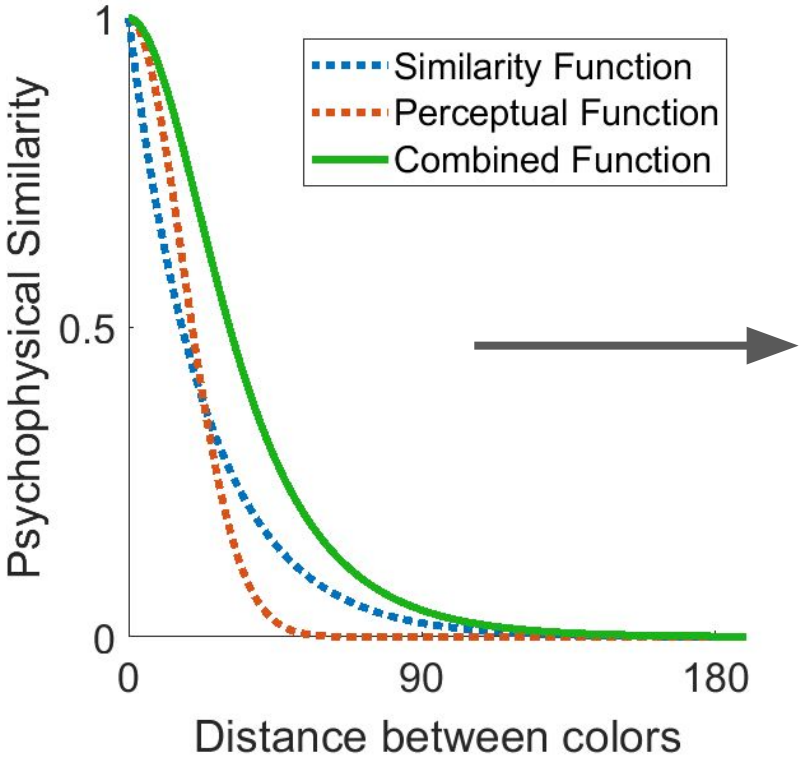


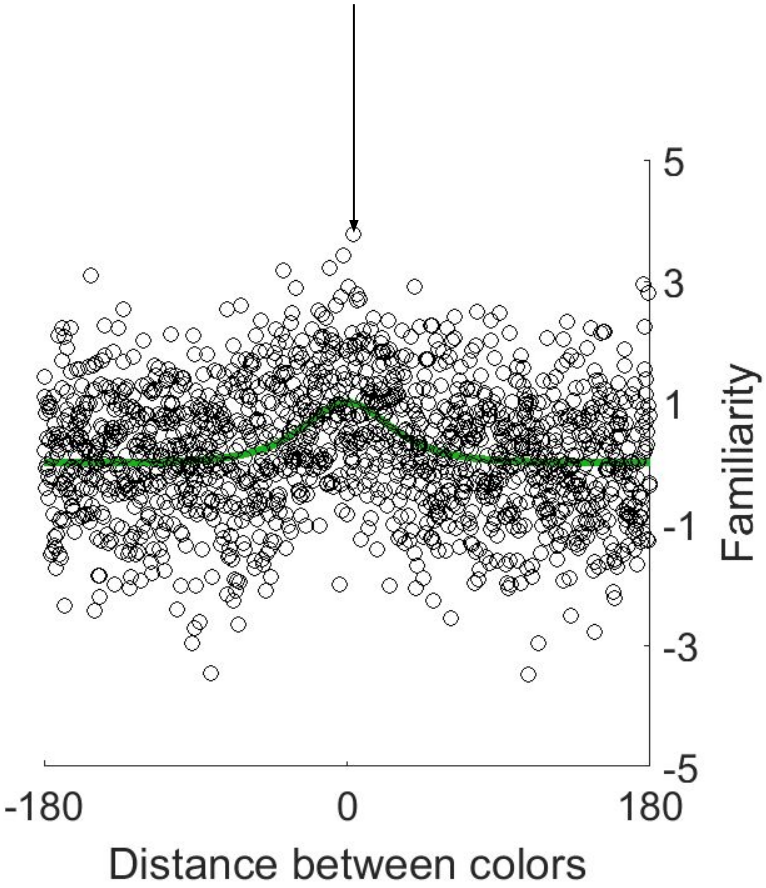


Based on F1F

Based on F2B

Modelling - TCC model

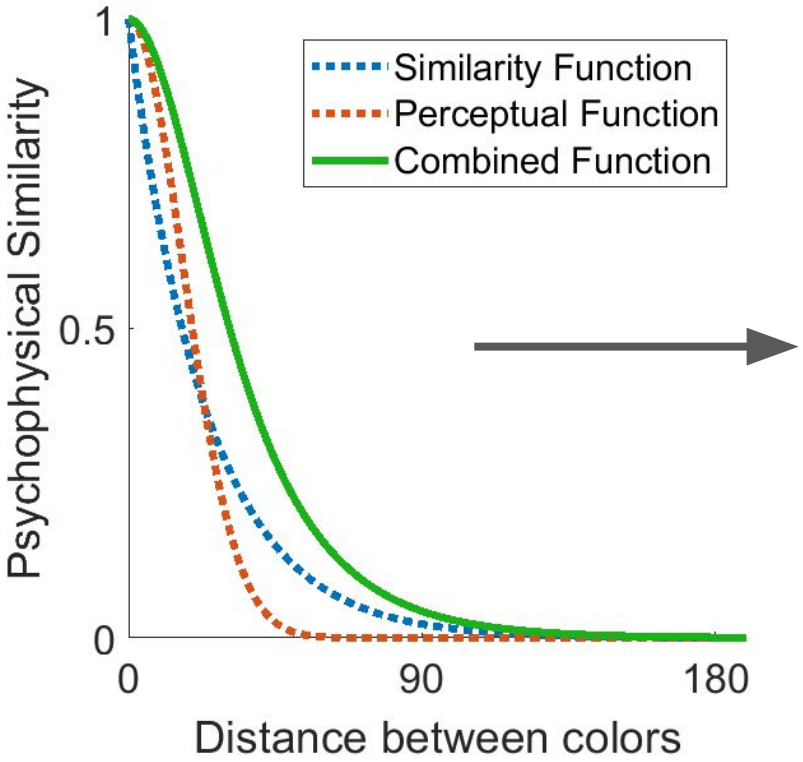




Based on F1F

Based on F2B

Modelling - TCC model



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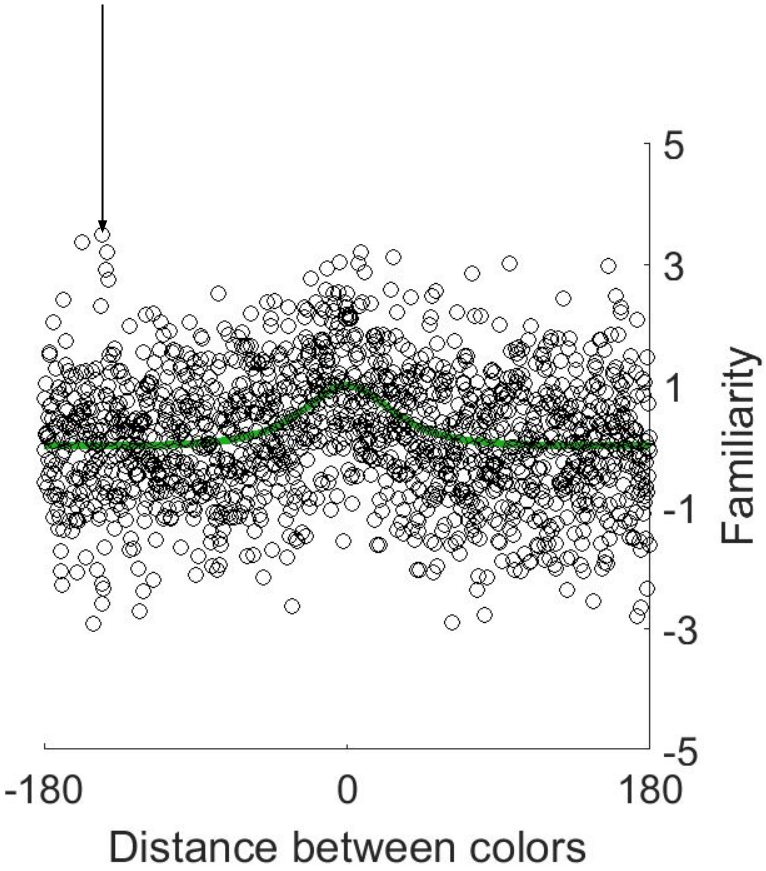
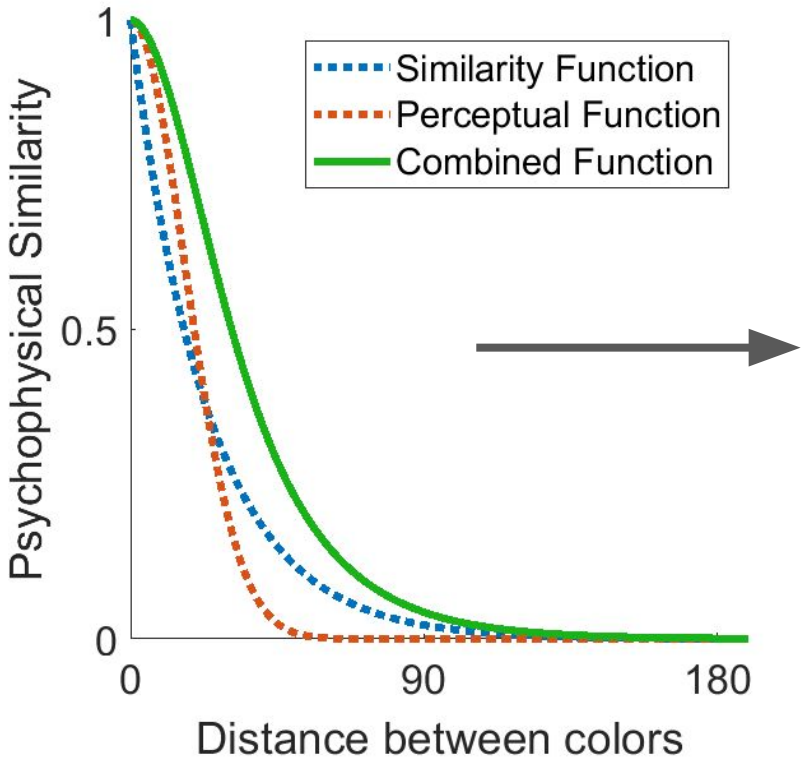
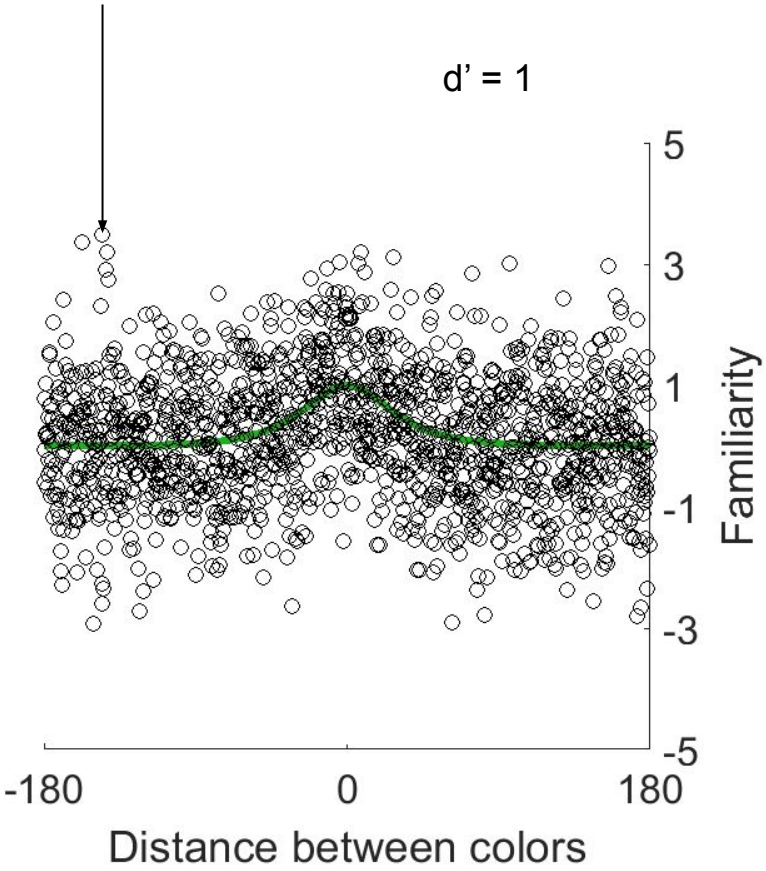


Based on F2B

Modelling - TCC model

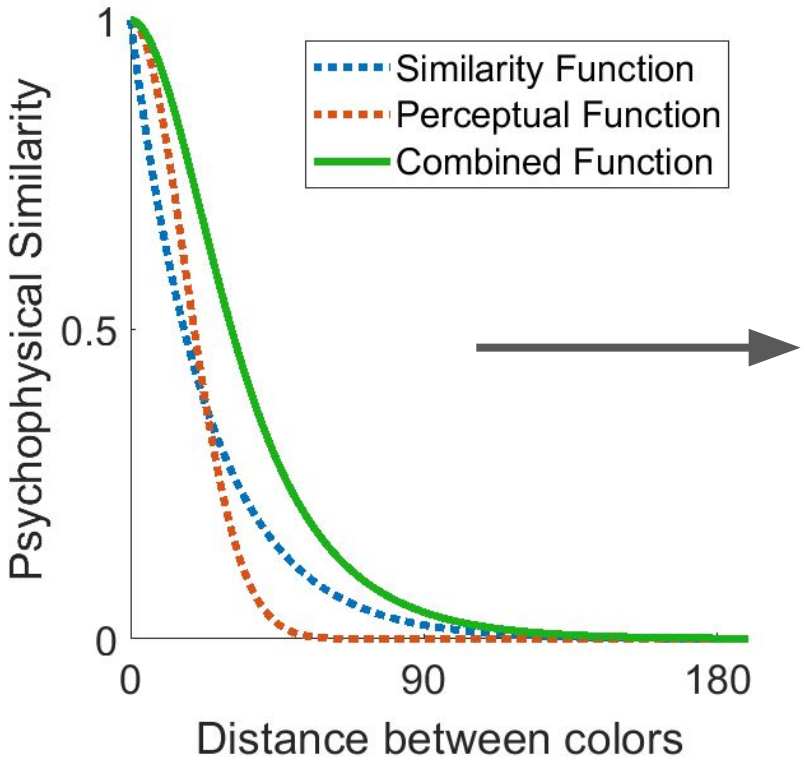


Based on F1F



Based on F2B

Modelling - TCC model



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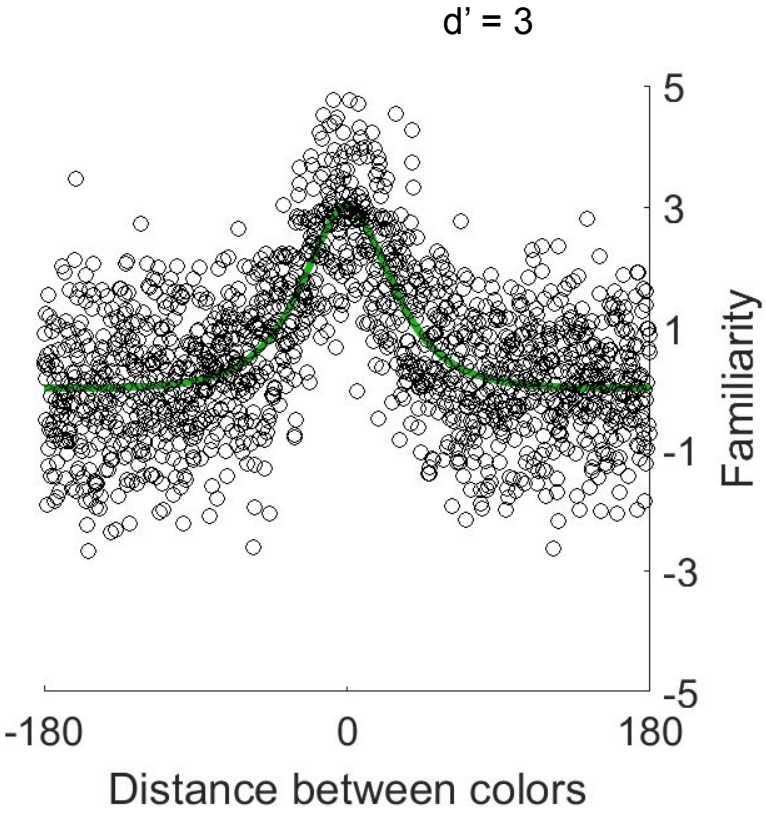
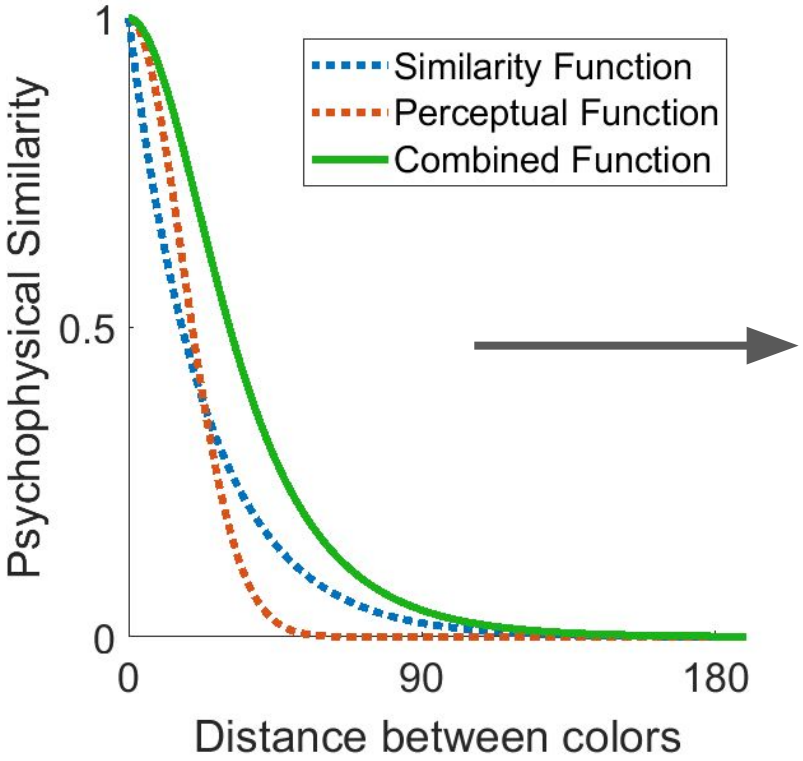
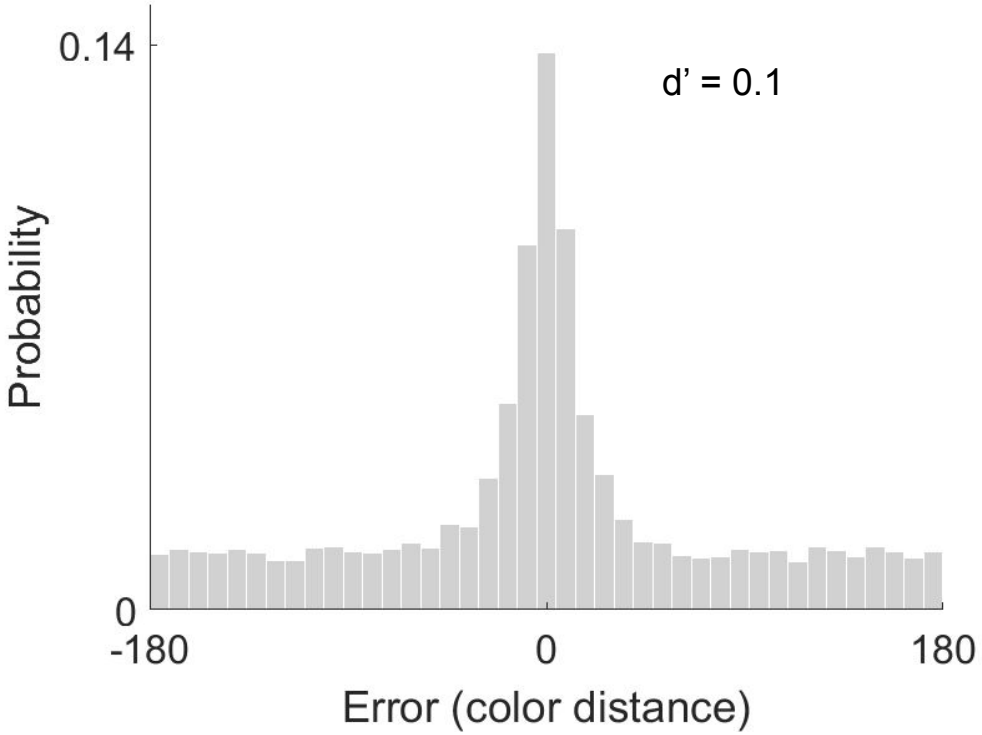


Based on F2B

Modelling - TCC model

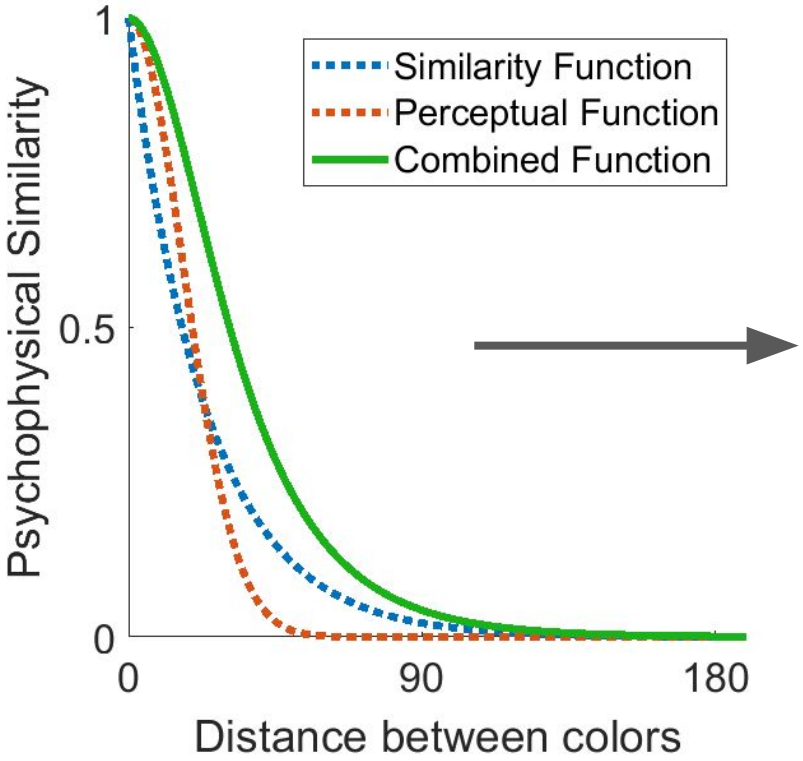


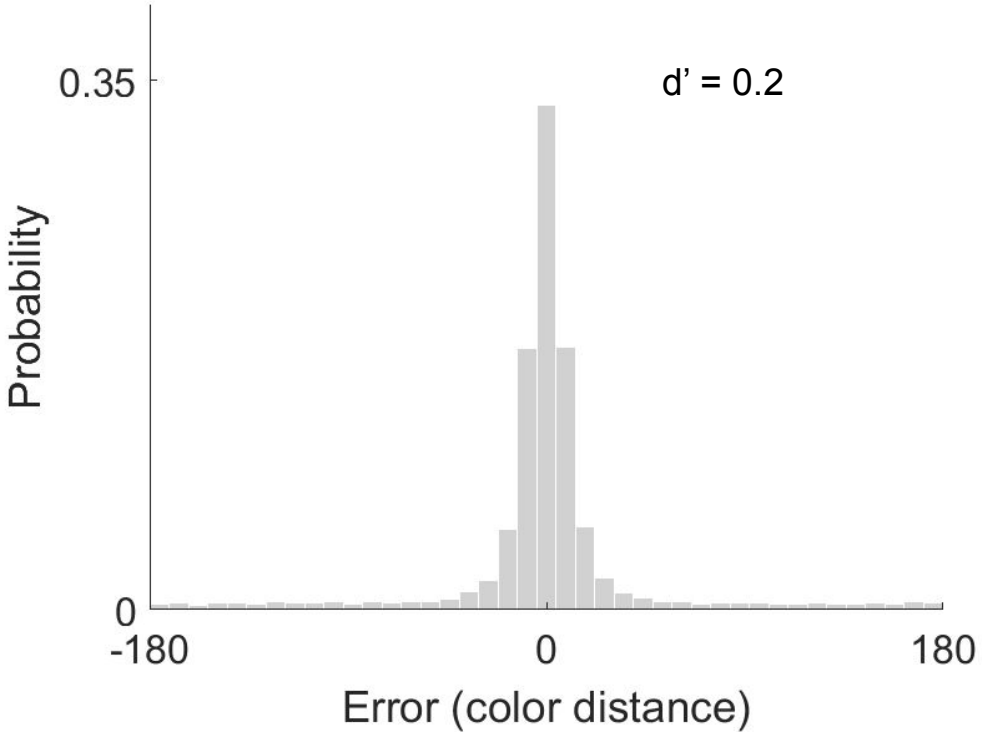


Based on F1F

Based on F1B

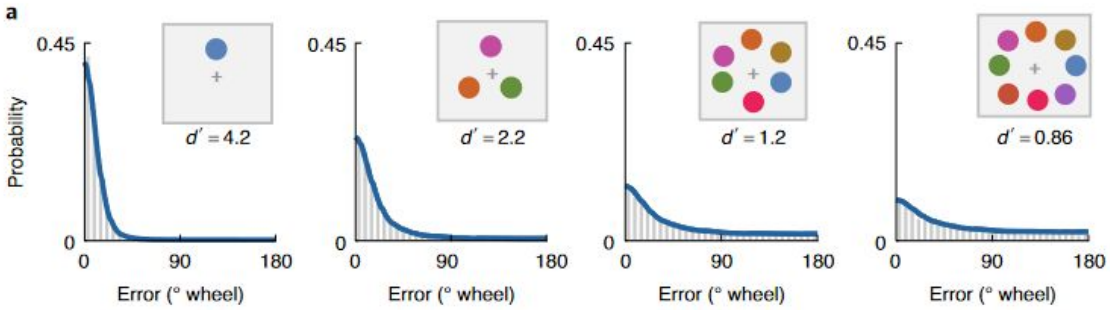
Modelling - TCC model



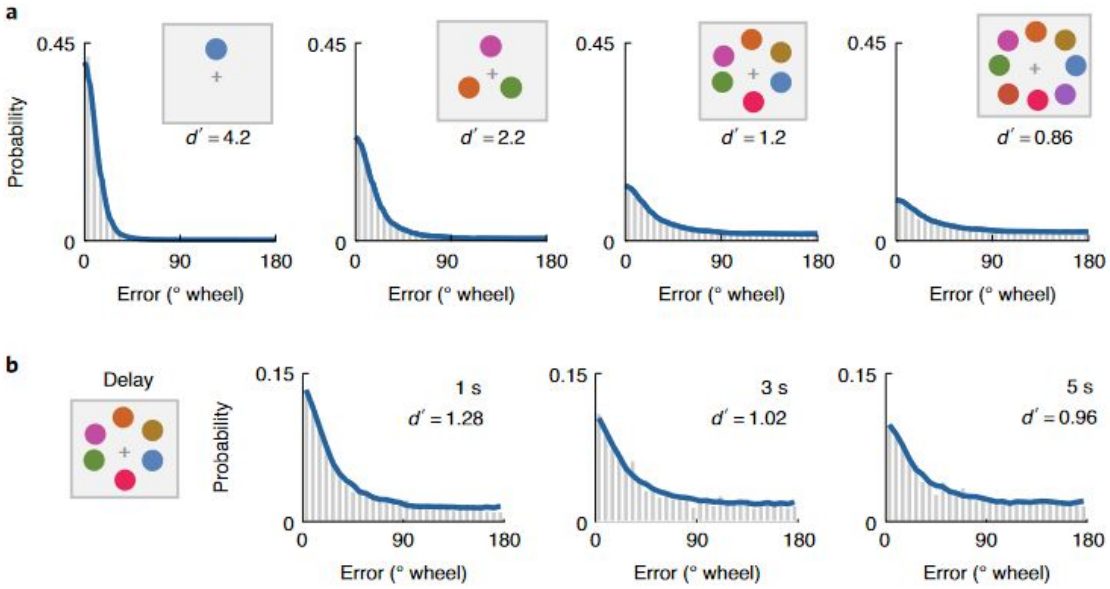


Based on F1F

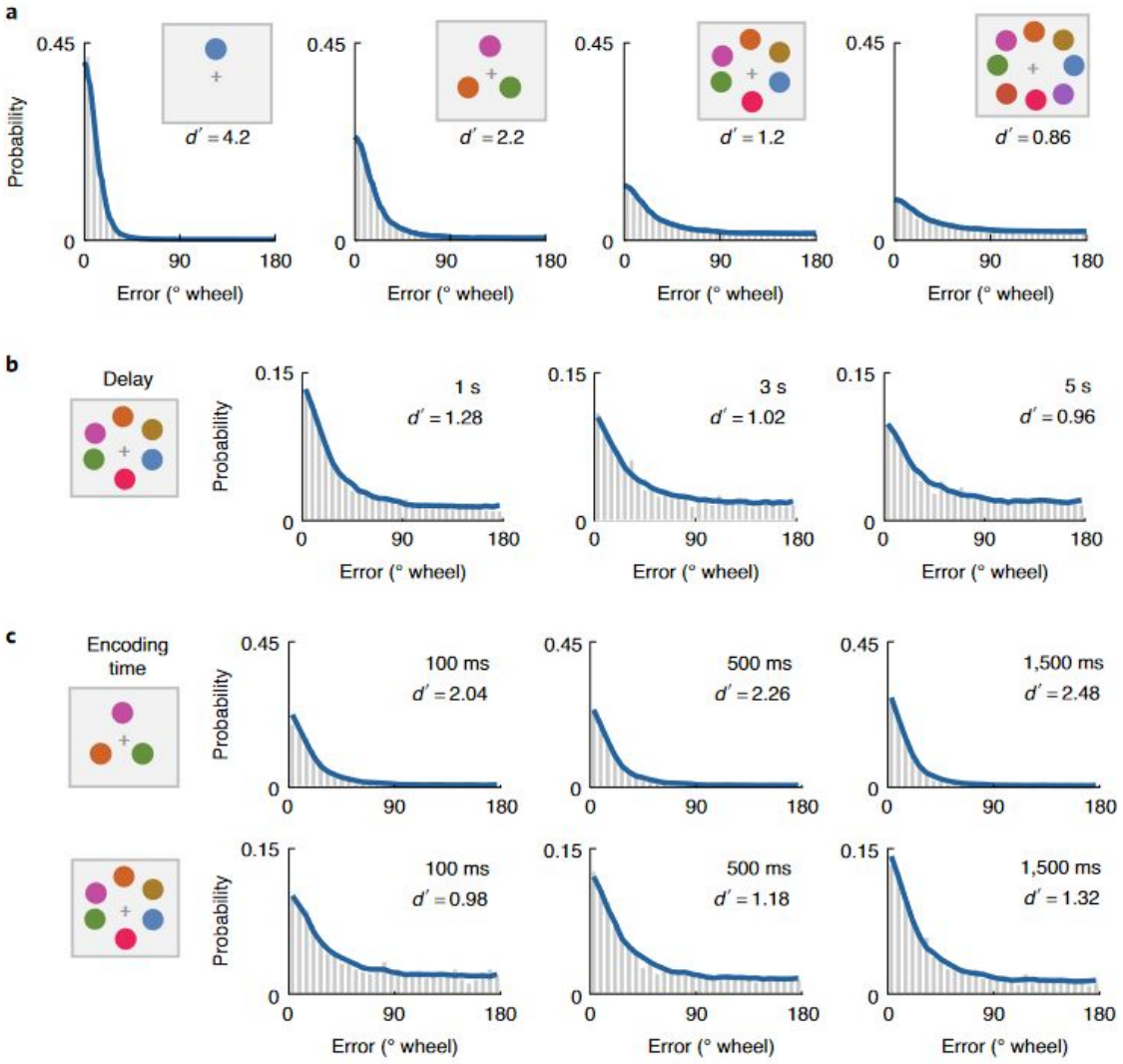
Based on F1B



F3


a
0.45
Probability
0
0
90
180
Error (° wheel)
d′ = 4.2
d′ = 2.2
d′ = 1.2
d′ = 0.86
b
Delay
0.15
1 s
d′ = 1.28
3 s
d′ = 1.02
5 s
d′ = 0.96

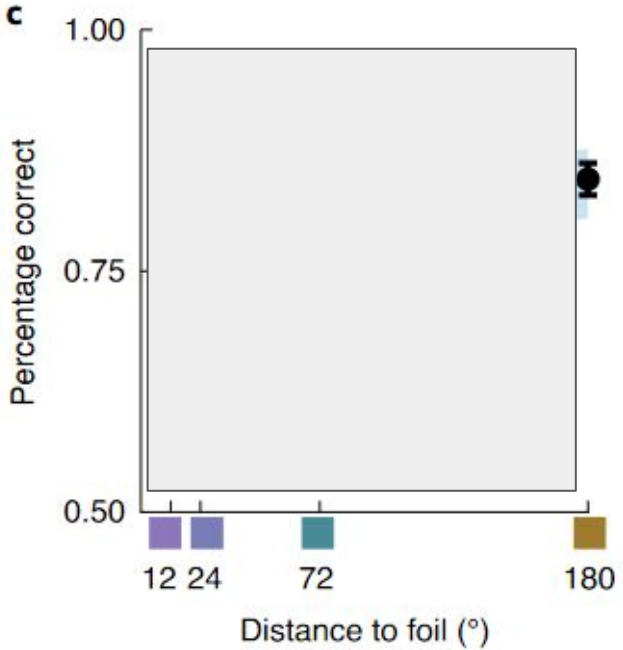
F3


a
0.45
Probability
0
0
90
180
Error (° wheel)
d′ = 4.2
d′ = 2.2
d′ = 1.2
d′ = 0.86
b
Delay
0.15
1 s
d′ = 1.28
3 s
d′ = 1.02
5 s
d′ = 0.96
c
Encoding time
100 ms
d′ = 2.04
500 ms
d′ = 2.26
1,500 ms
d′ = 2.48
d′ = 0.98
d′ = 1.18
d′ = 1.32

F3

Predicting performance across the space **just from d’**

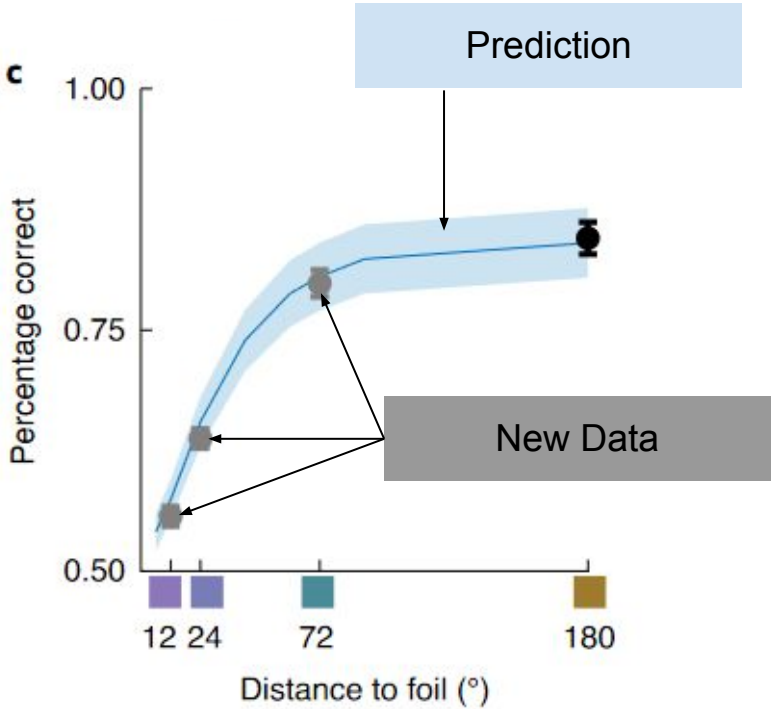
Encoded colour



F4C

Predicting performance **just from d'**

Encoded colour



F4C

Biases in working memory responses

Why some colors appear more memorable than others: A model combining categories and particulars in color working memory.

Bae, Olkkonen, Allred, Flombaum (2015)

https://doi.org/10.1037/xge0000076

Error-correcting dynamics in visual working memory

Panichello, DePasquale, Pillow, Buschman (2019)

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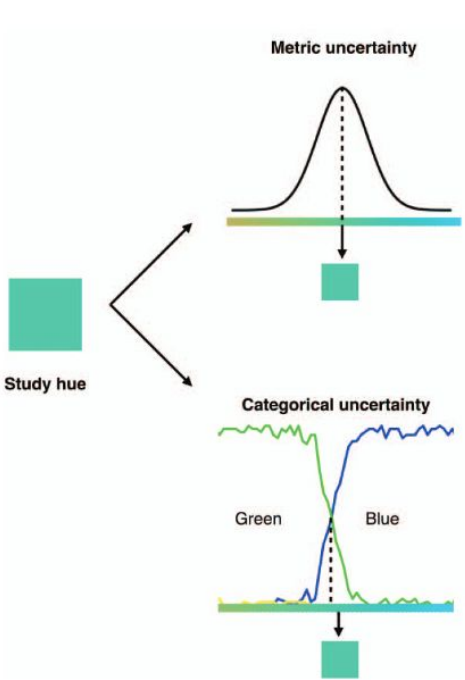

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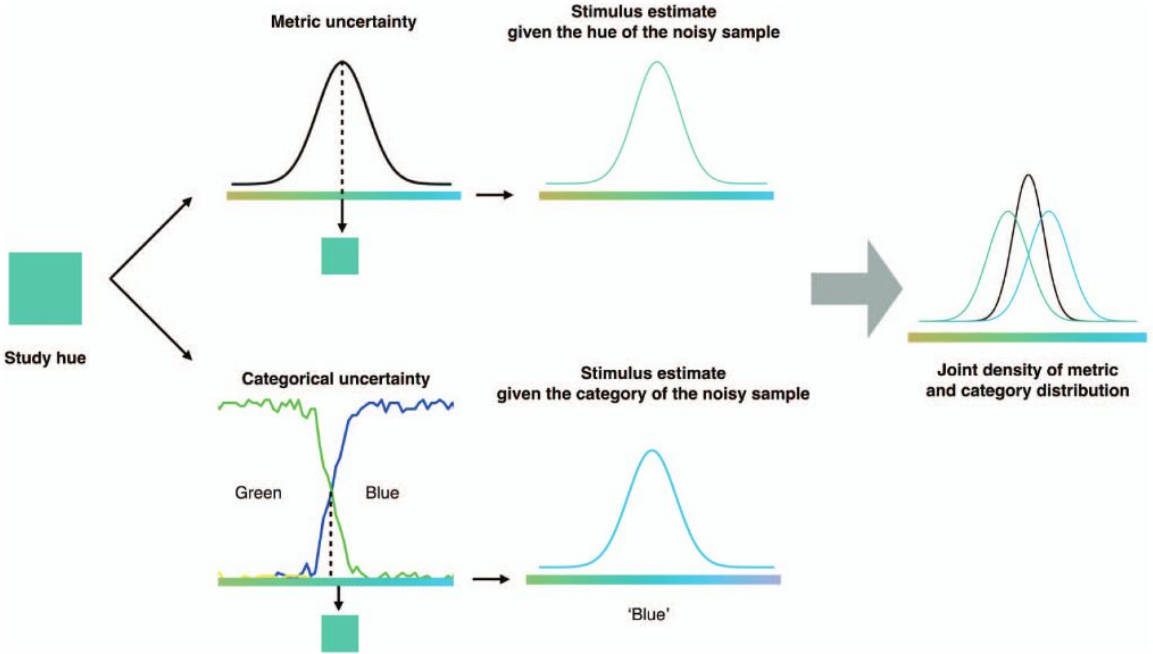

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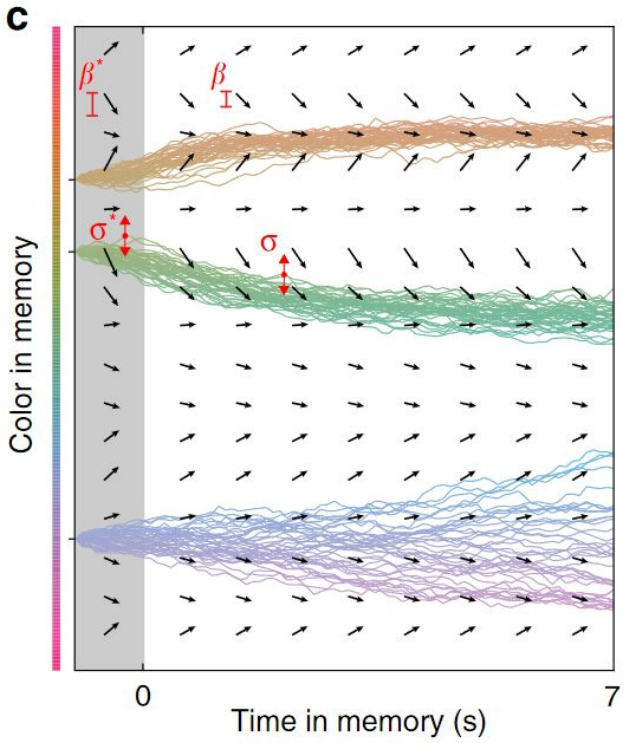

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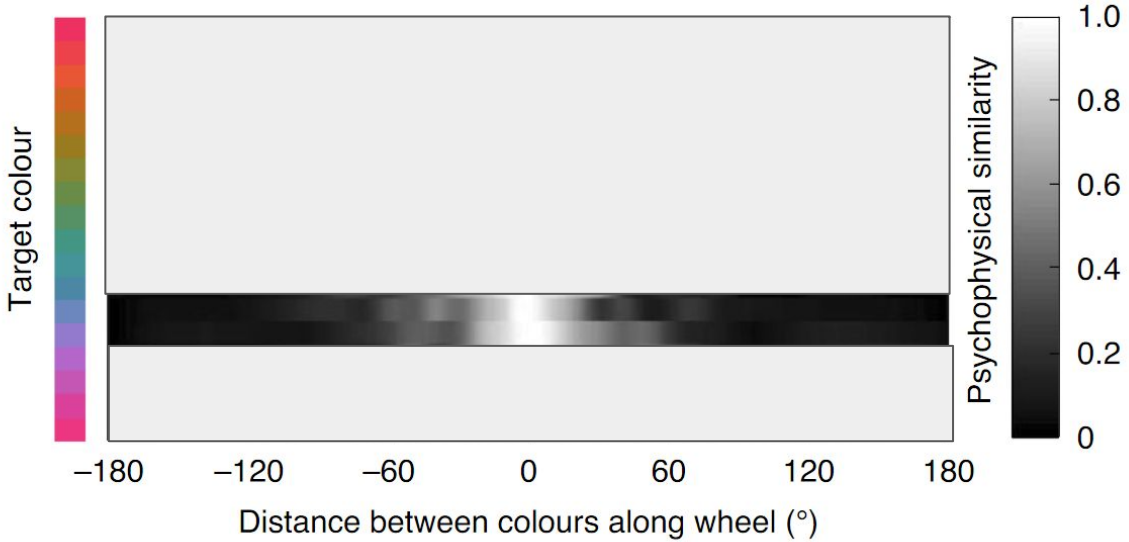
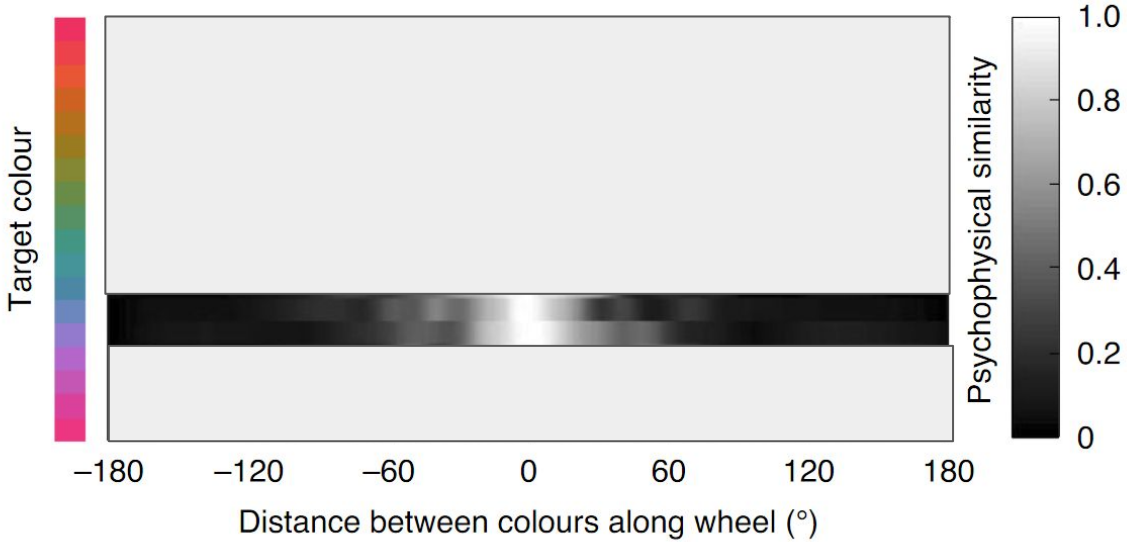
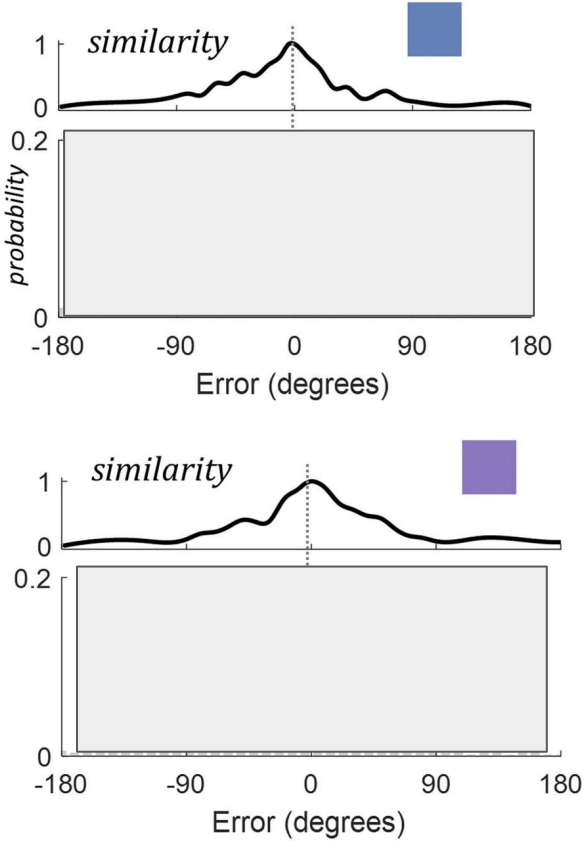


F1D

Schurgin, Wixted, Brady (2020)

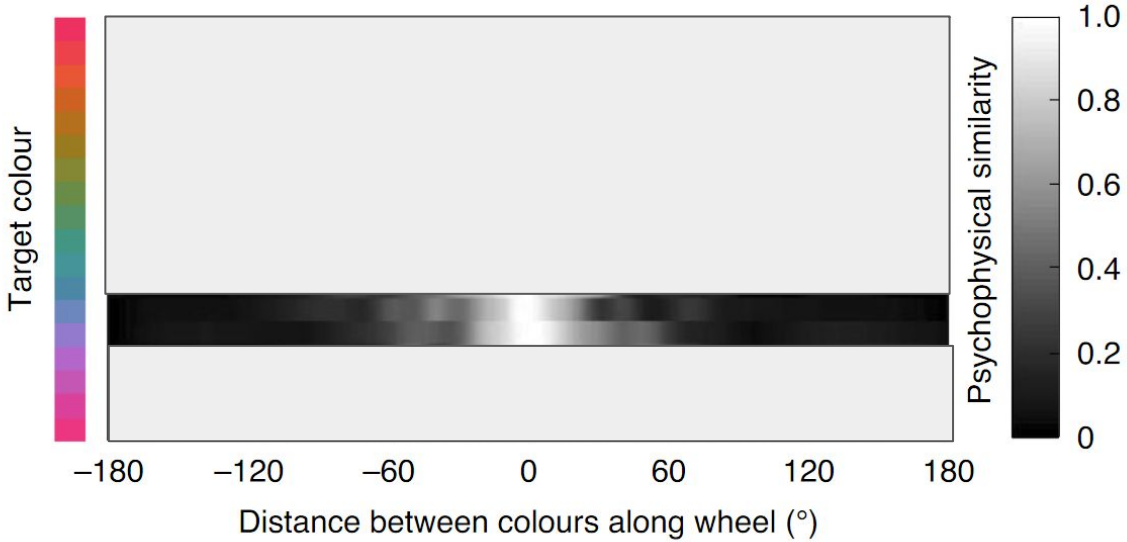


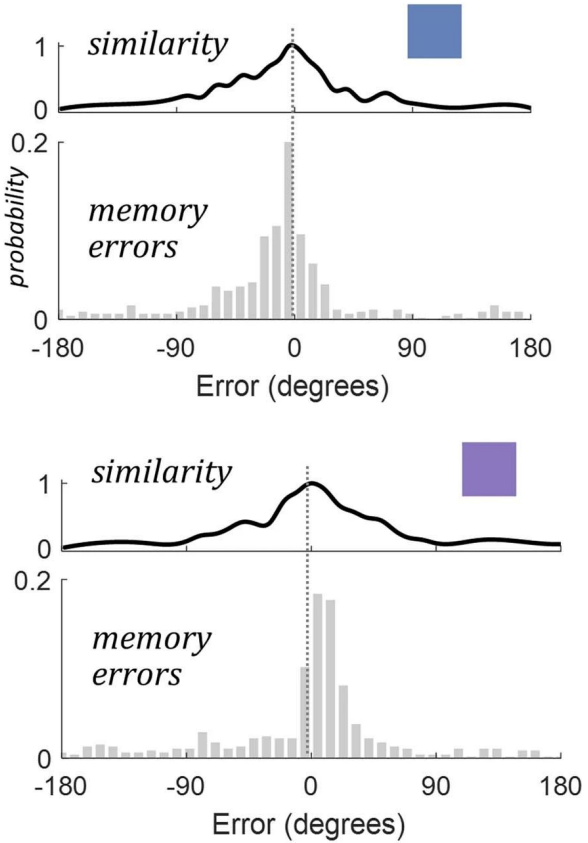


F1D

*ED*F5

Schurgin, Wixted, Brady (2020)

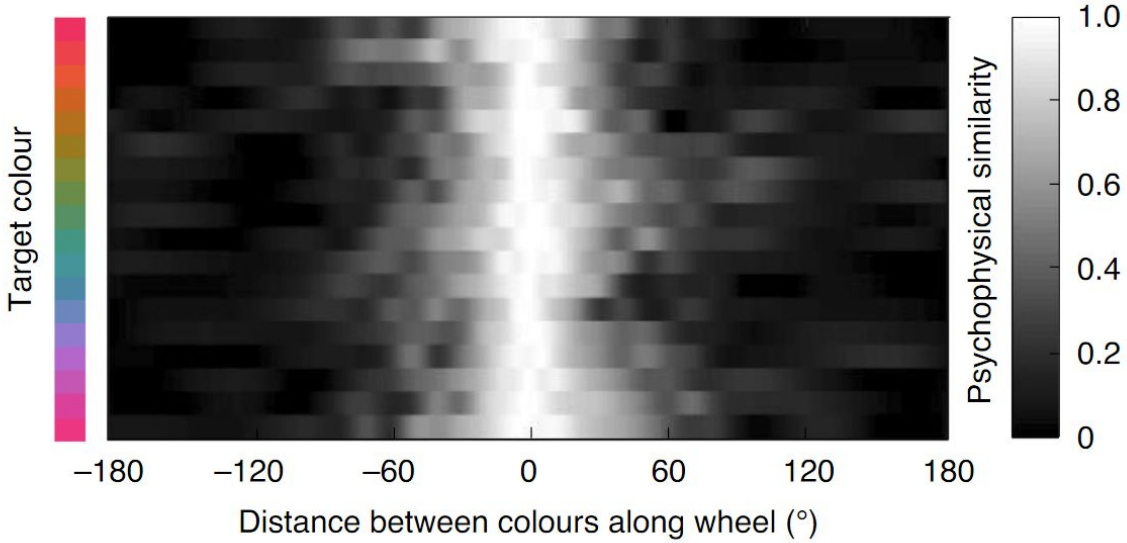


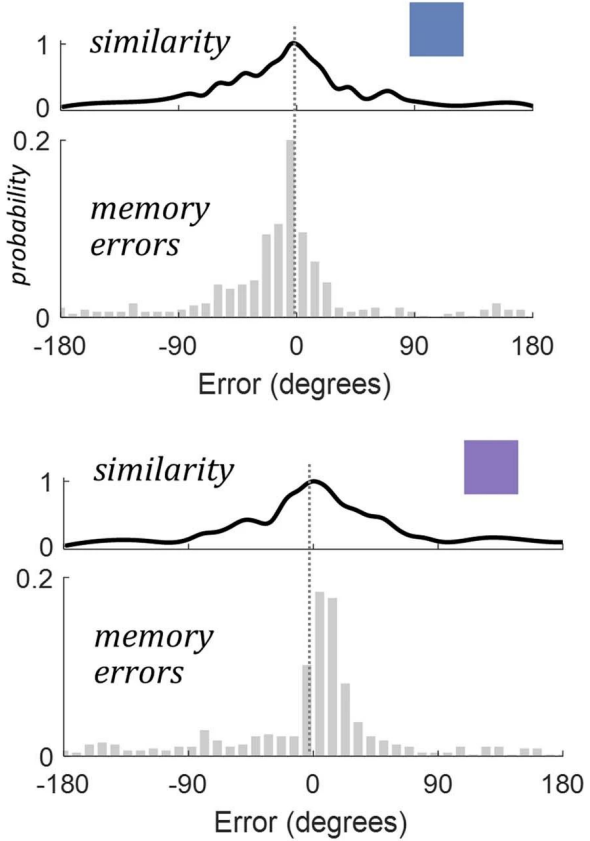


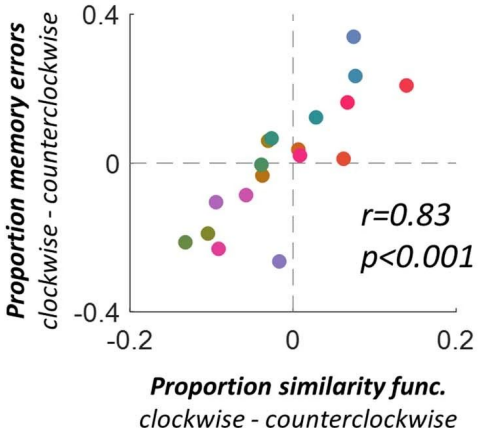
F1D

*ED*F5

Schurgin, Wixted, Brady (2020)







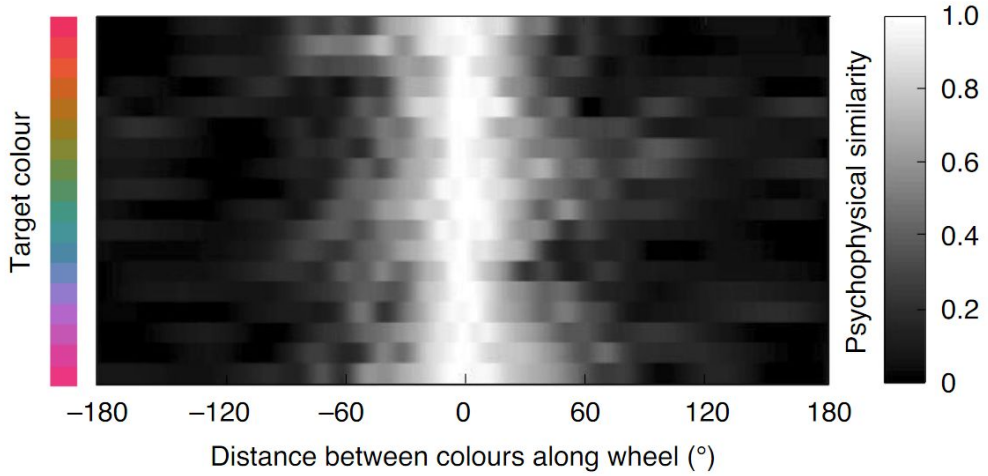
F1D

*ED*F5

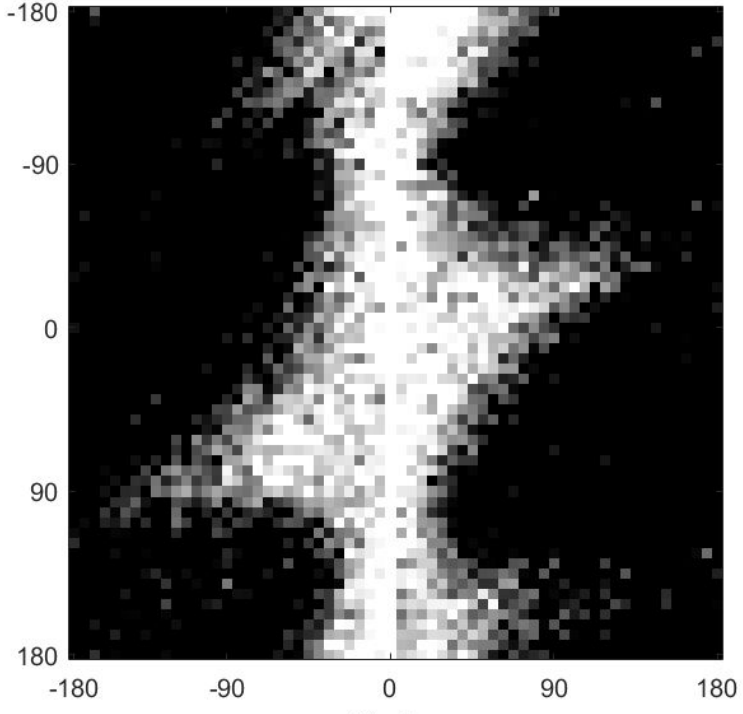
Multiple different similarity functions (in current space)?
Or a single similarity function in a modified space?

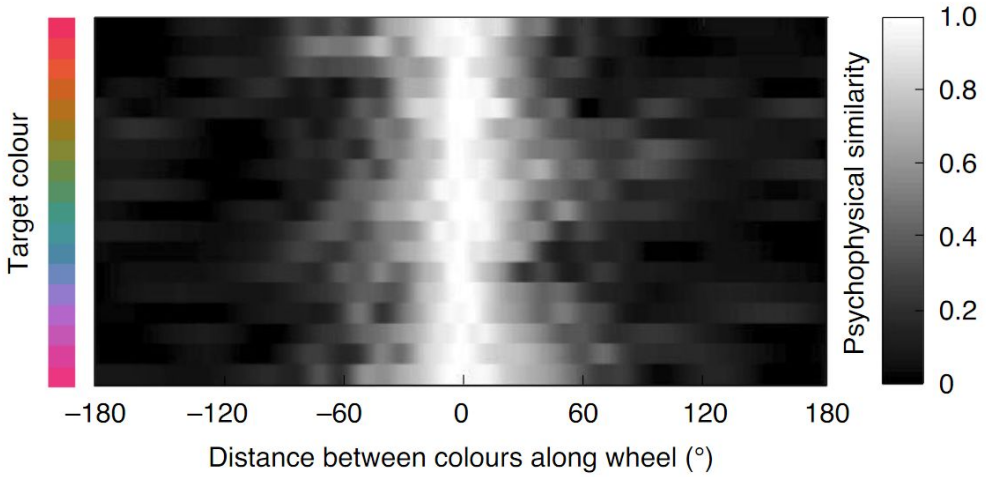
https://www.flaticon.com/free-icon/color-palette_2868103#
https://www.flaticon.com/free-icon/triangular-ruler_2775432

Modelling data collected in *our* lab



Modelling data collected in *our* lab





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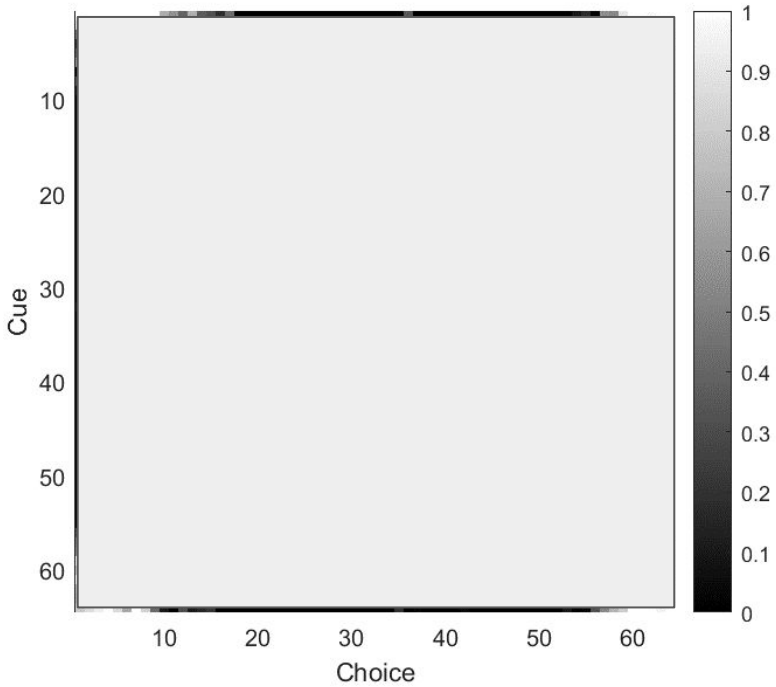
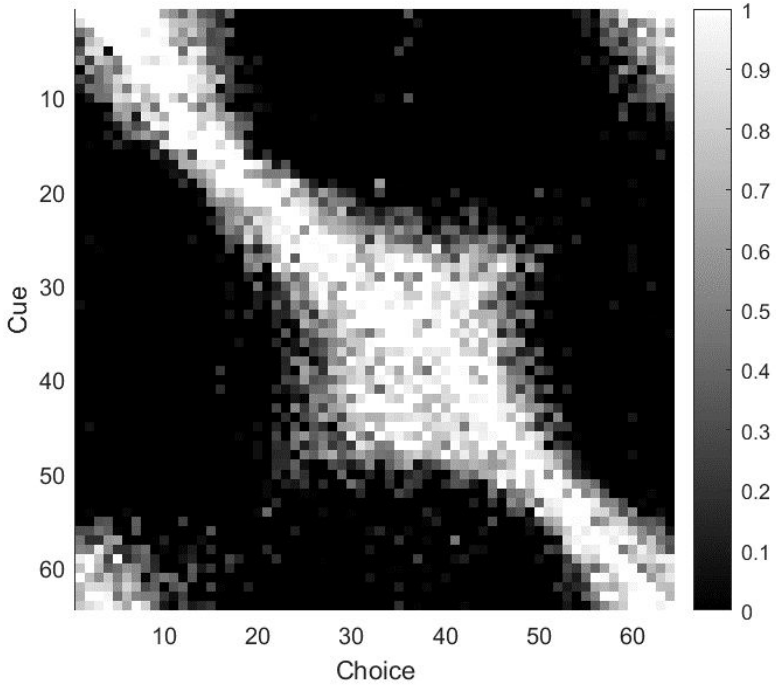
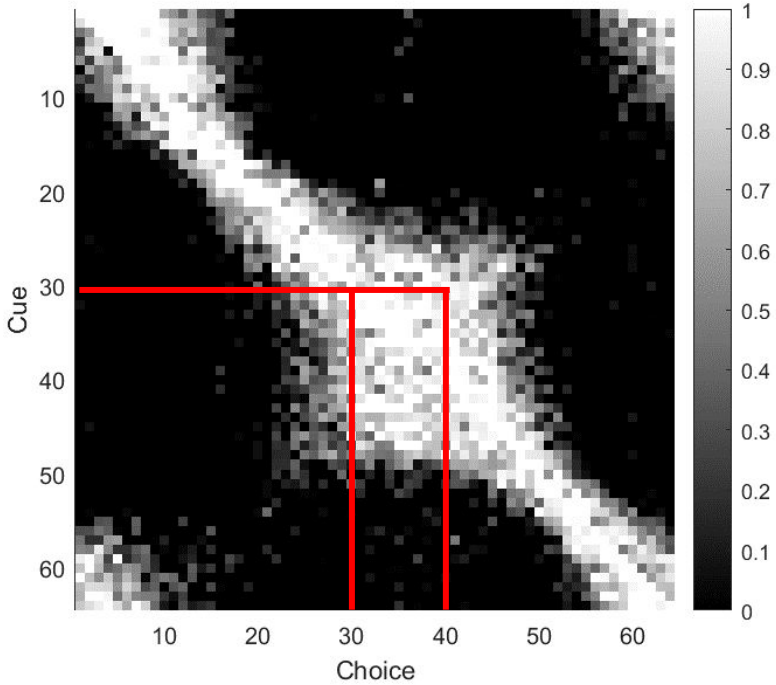


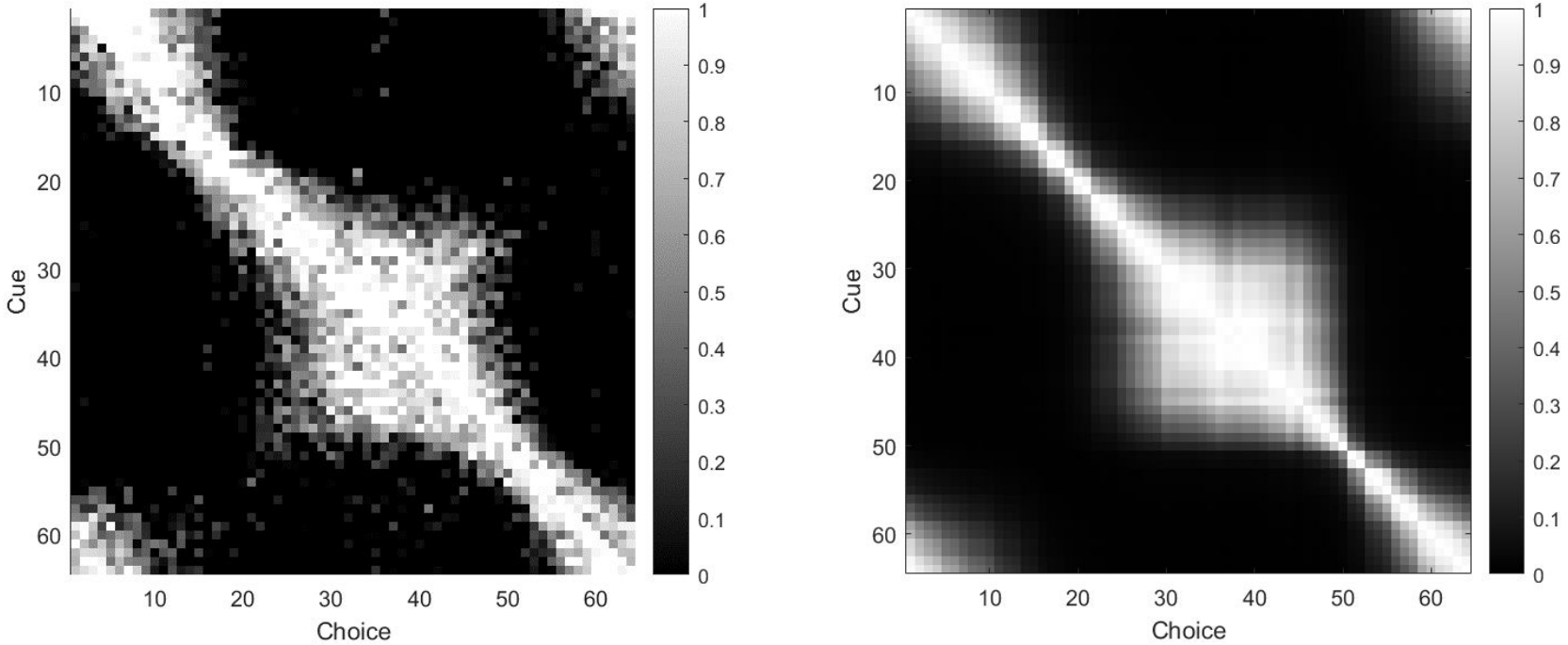
Modelling data collected in *our* lab



Modelling data collected in *our* lab



Modelling data collected in *our* lab



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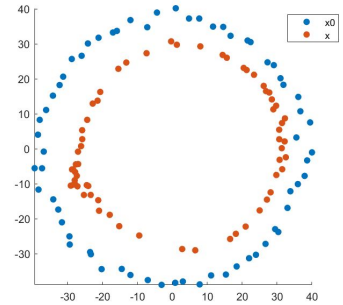

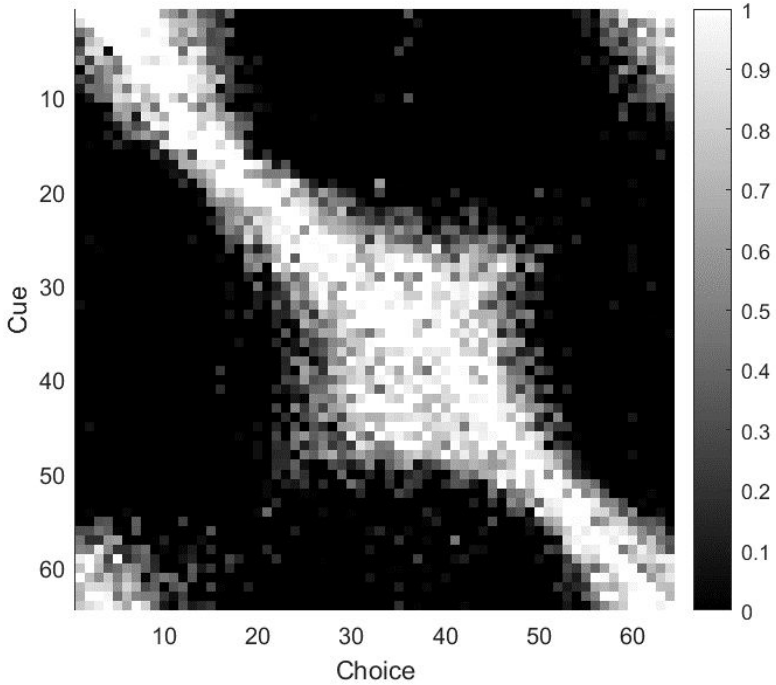

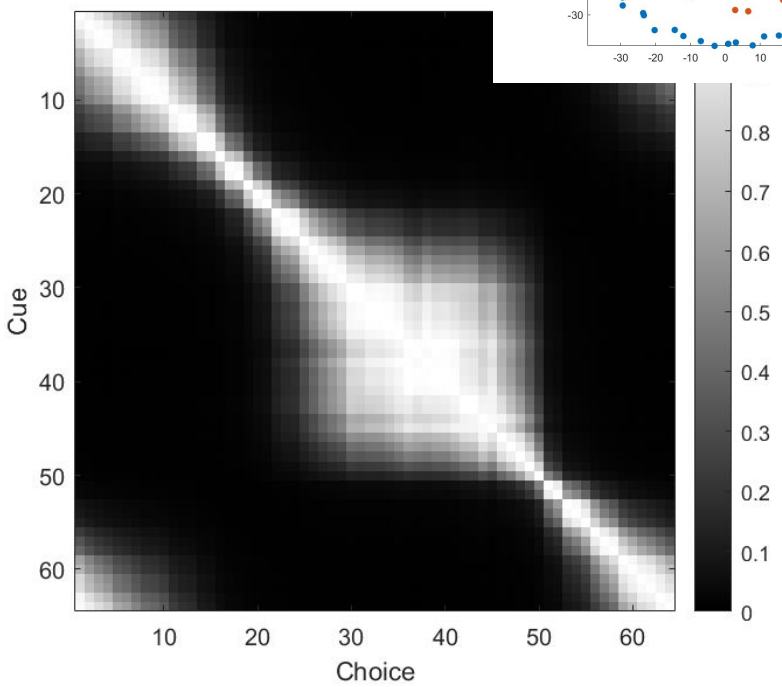

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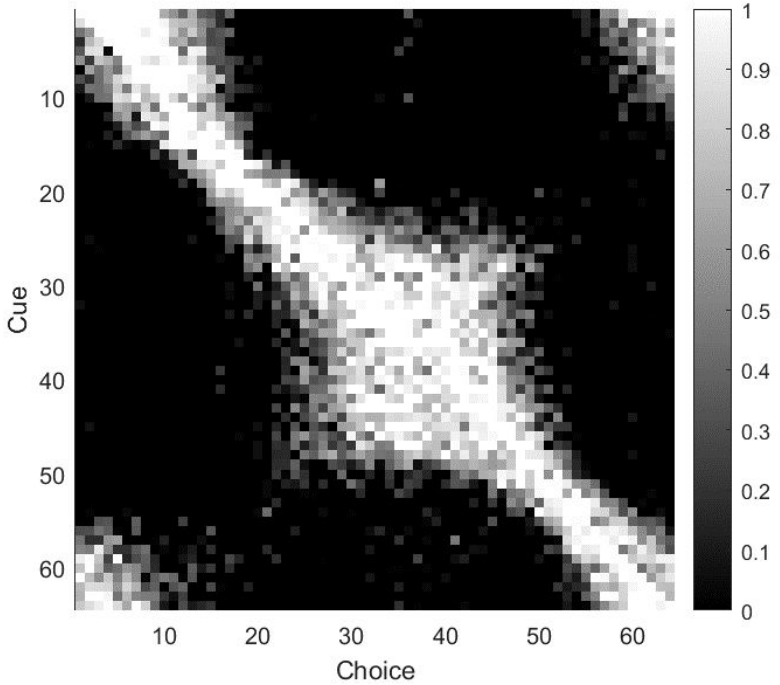

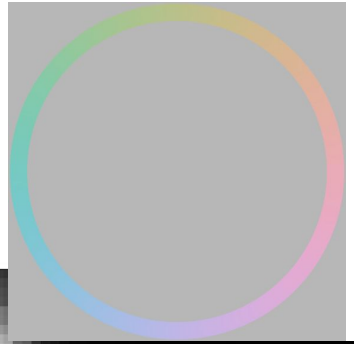

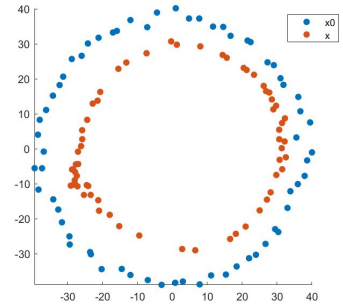

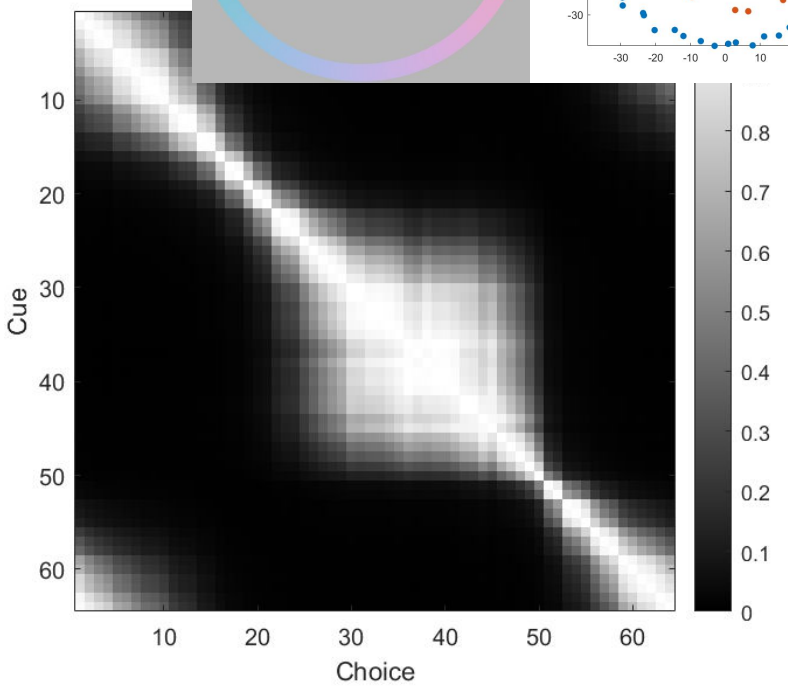

Conclusions

- Nice model
  - Parsimonious
  - Biologically plausible (?)
- Building on it for our work looking at bias

If anyone has good ideas/experience extracting confidence/likelihood intervals from models with many correlated parameters, help!?