CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD

School of Psychology

WALES AUTISM RESEARCH CENTRE
CANOLFAN YMCHWIL AWTISTIAETH CYMRU

Visual attention and sensory processing in ASD: research approaches and eyetracking methods

Georgie Powell
Tom Freeman

Starptautiska Konference, Riga 2016

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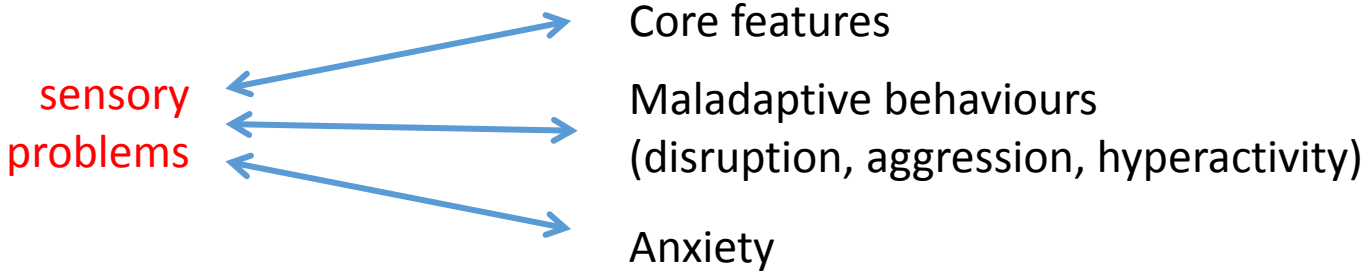
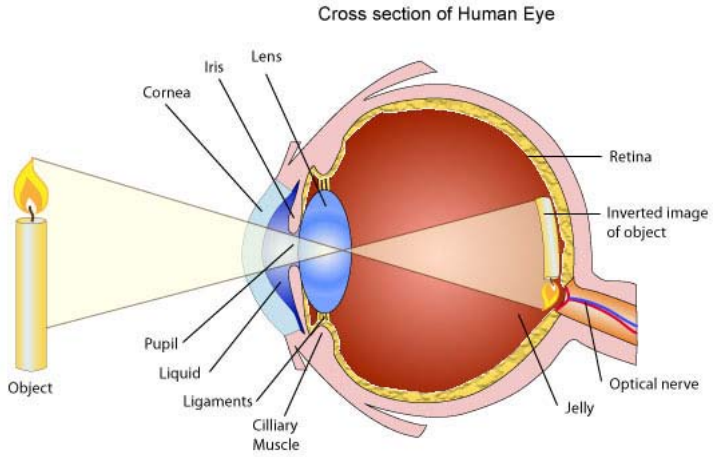
ASD and the senses

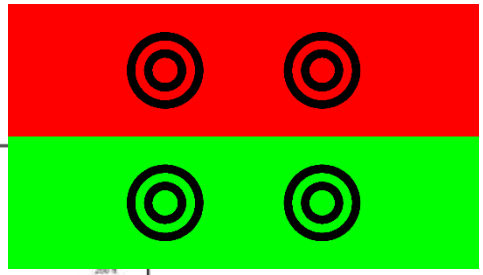
High prevalence of sensory problems in Autism Spectrum Disorder (ASD) – more than 90% of individuals (Leekam et al., 2007)

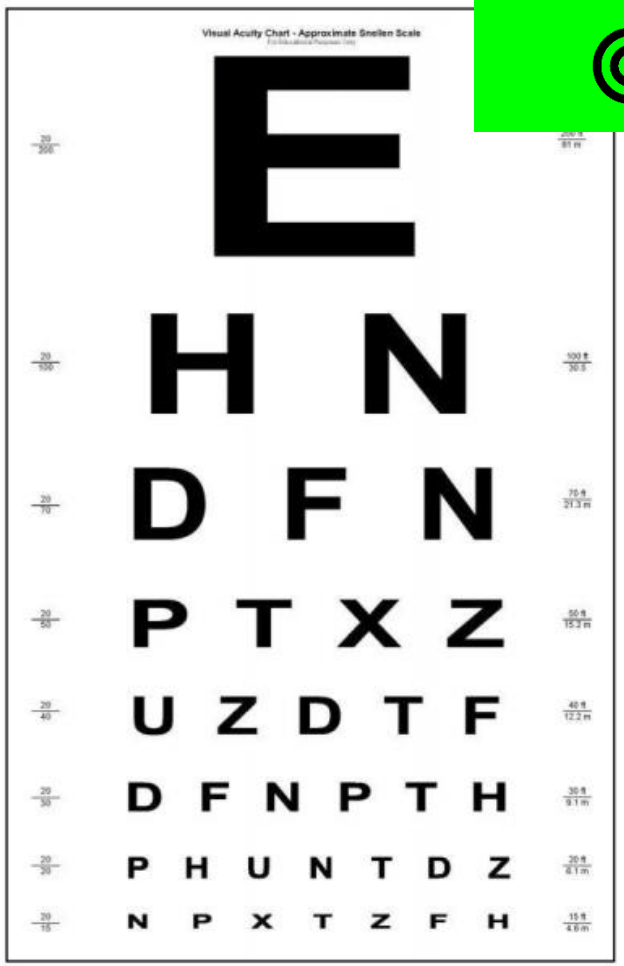
Historically sensory problems overlooked in diagnostic criteria of ASD compared to core features (social & communication difficulties, repetitive behaviours) - but now added to DSM V

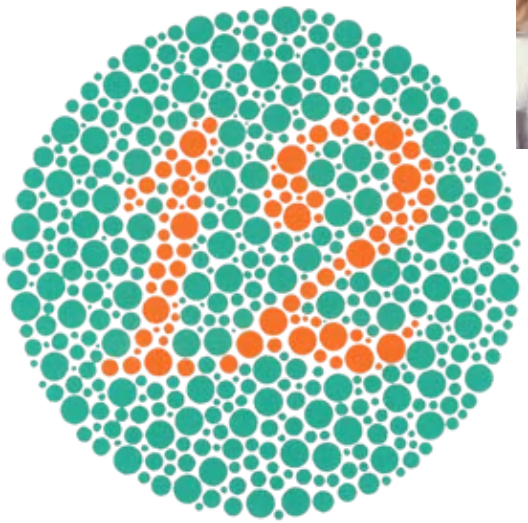


What is ‘sensory’?



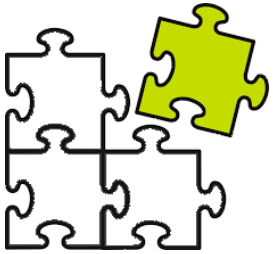


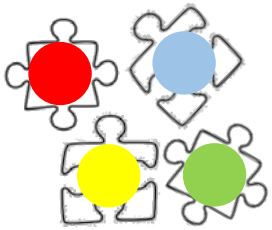




people
road
bus

‘PERCEPTION’



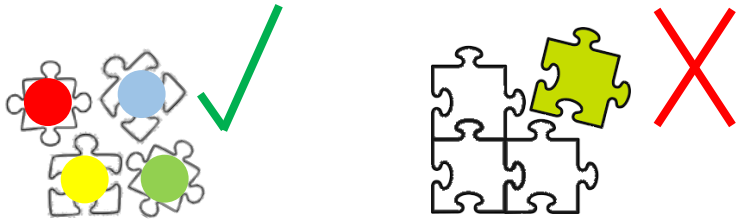


colours
edges
blobs

‘SENSATION’

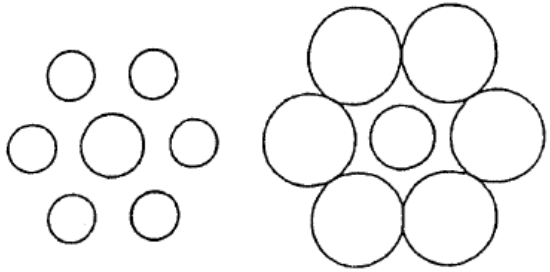
ASD and visual illusions

Happe (1996) – ASD see 'accurately'



Ponzo illusion

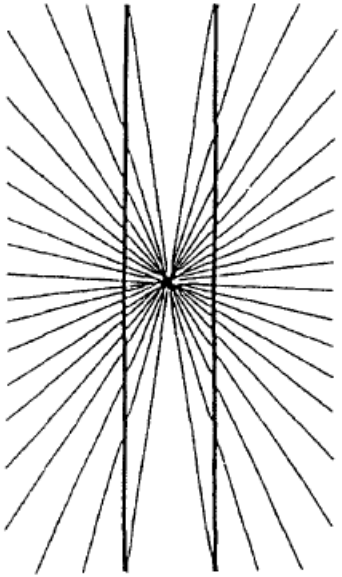
Titchener circles



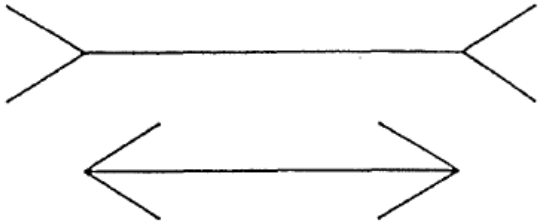
Control figure

Are these two circles different sizes or the same size?

Hering illusion



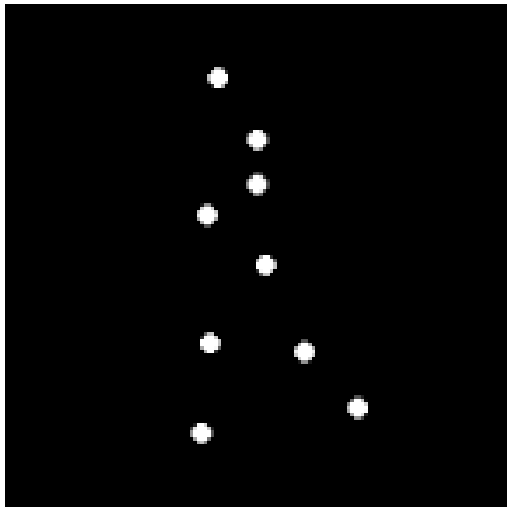
Muller-Lyer figures



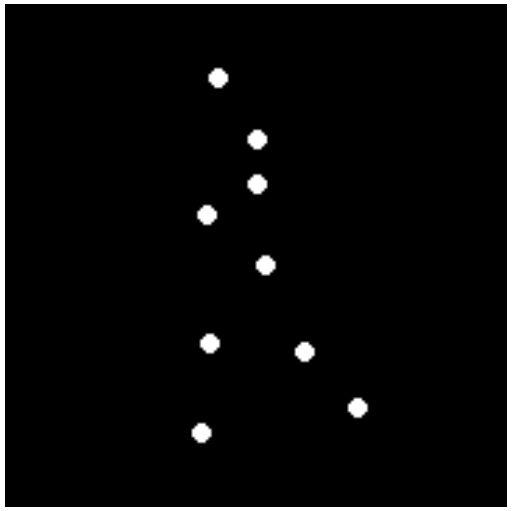
Control figure

Are these two lines the same length or different lengths?

ASD and visual perception

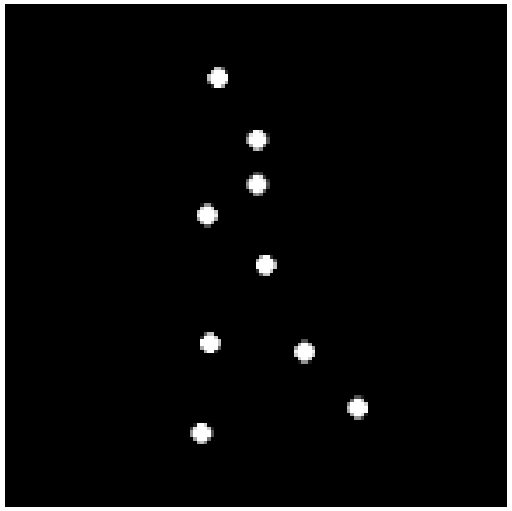


ASD and visual perception



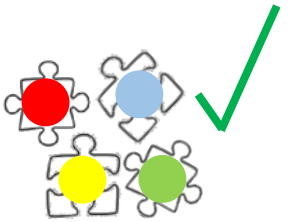
ASD less able to see ‘biological motion’

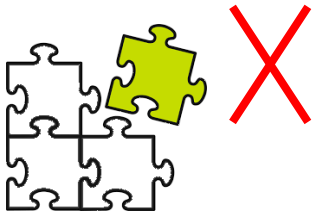
ASD and visual perception

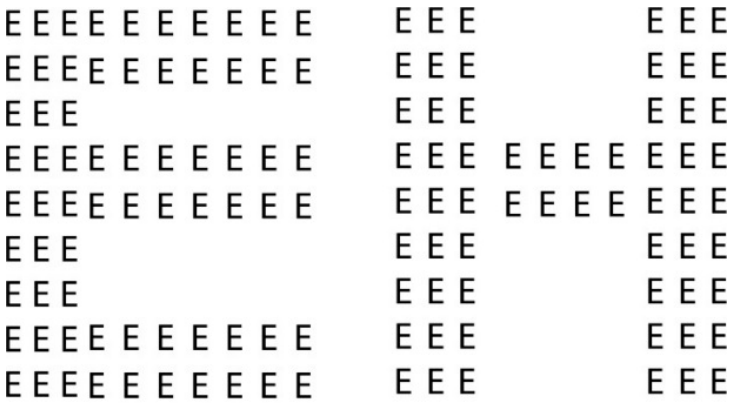


ASD less able to see ‘biological motion’

ASD struggle to name ‘large’ letter when ‘little’ letters are different



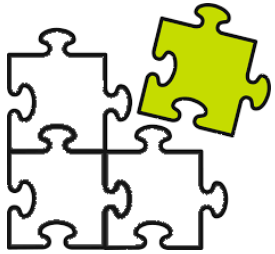




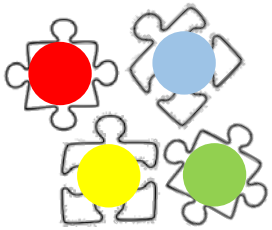
ASD find ‘embedded’ figure more easily

people
road
bus

‘PERCEPTION’

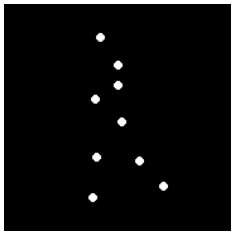


How does the brain do jigsaws?



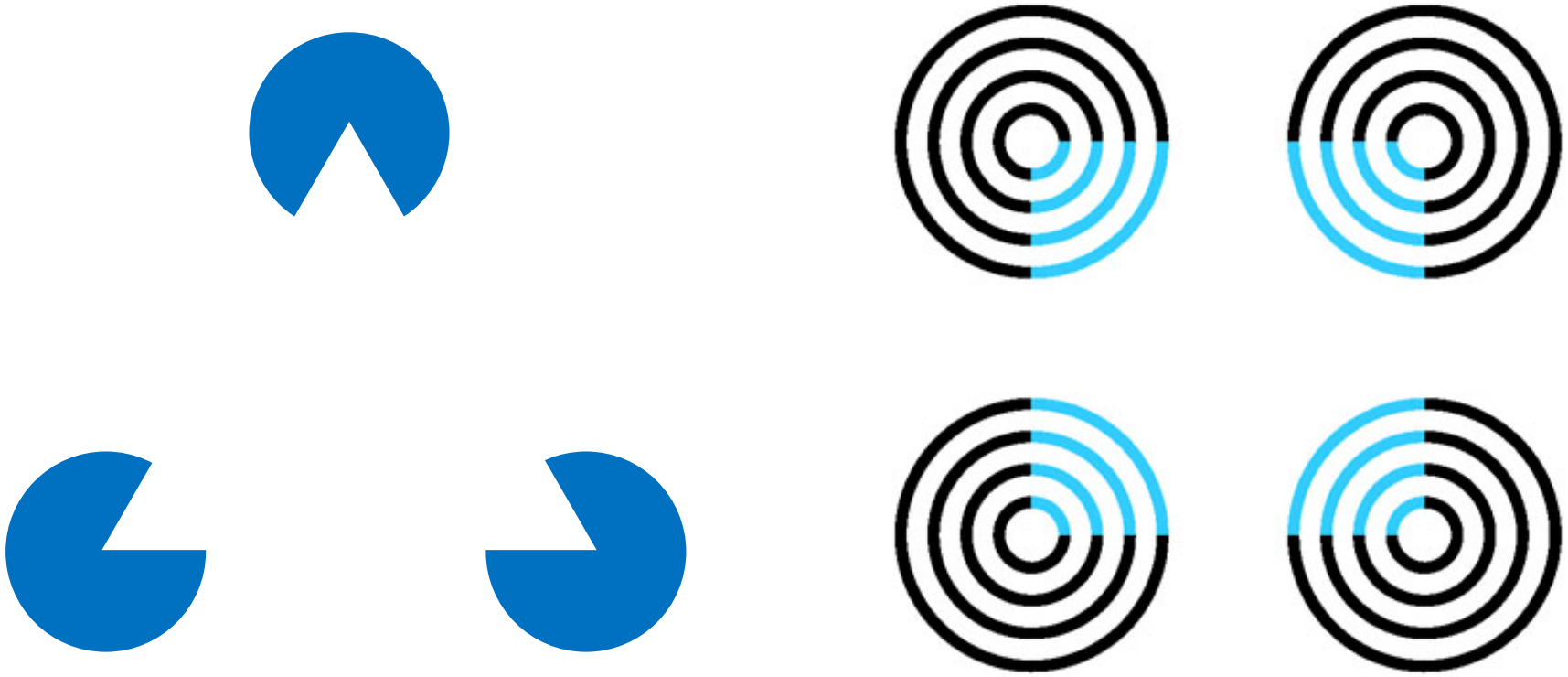
colours
edges
blobs

‘SENSATION’

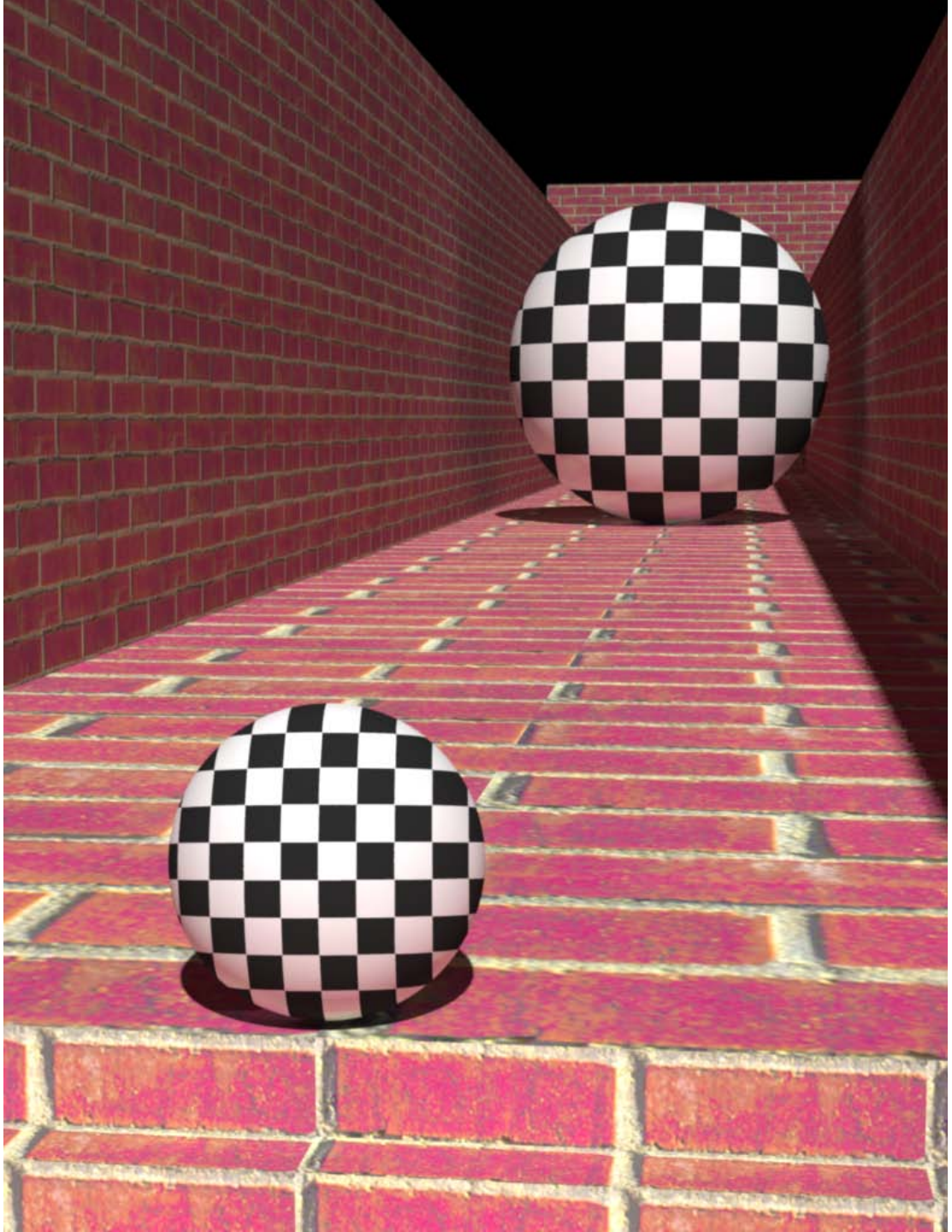


prior knowledge about world

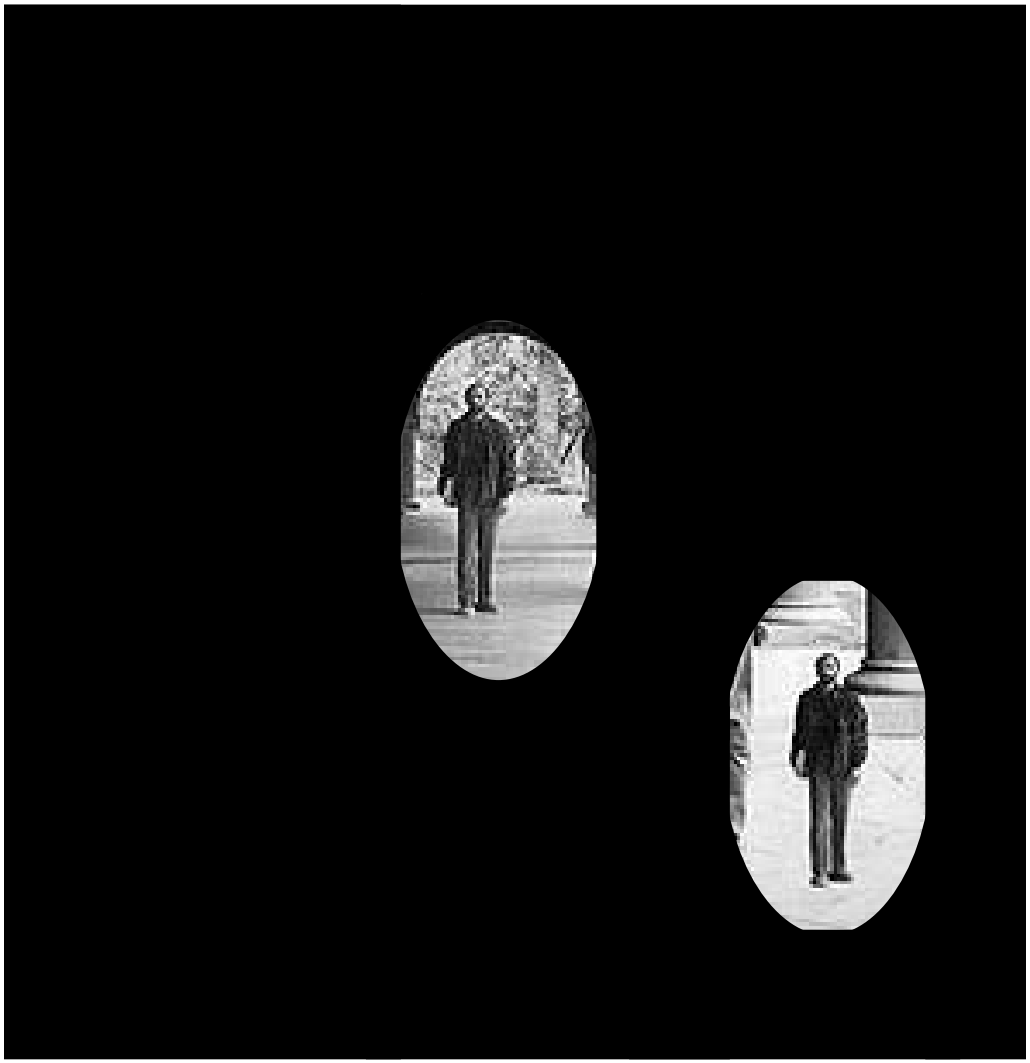
Edges = Objects



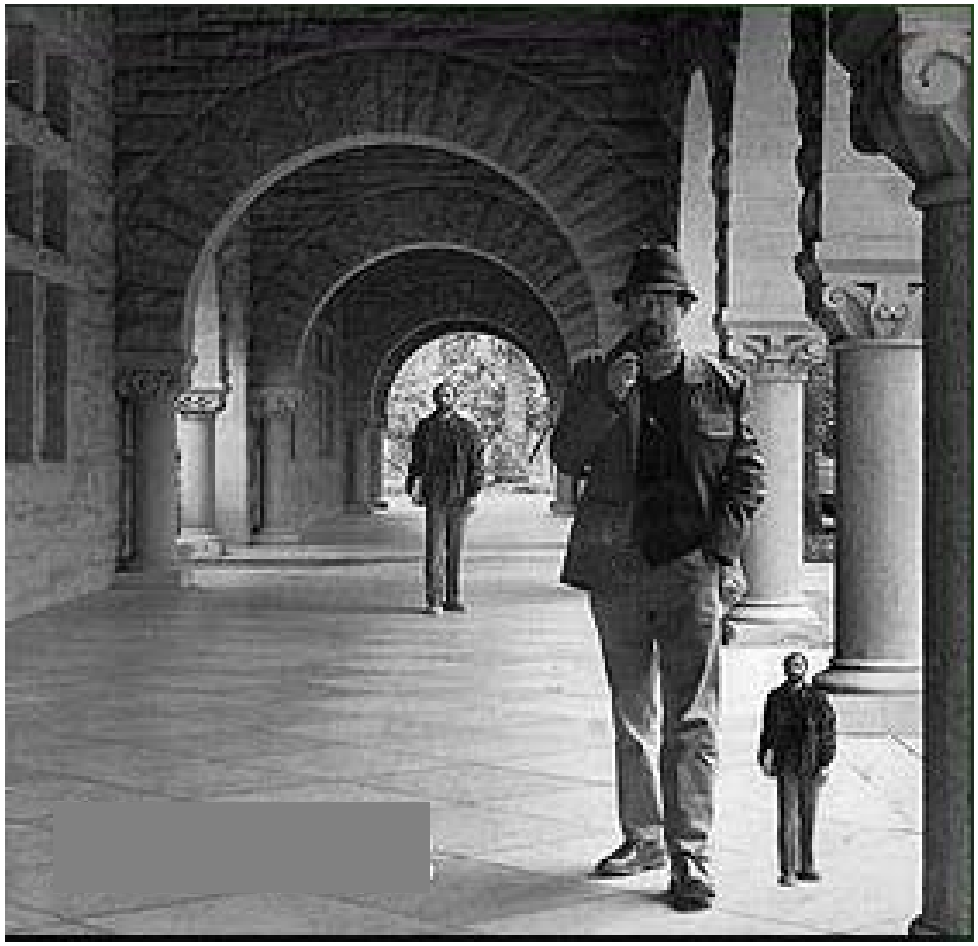
Rules of 3D geometry



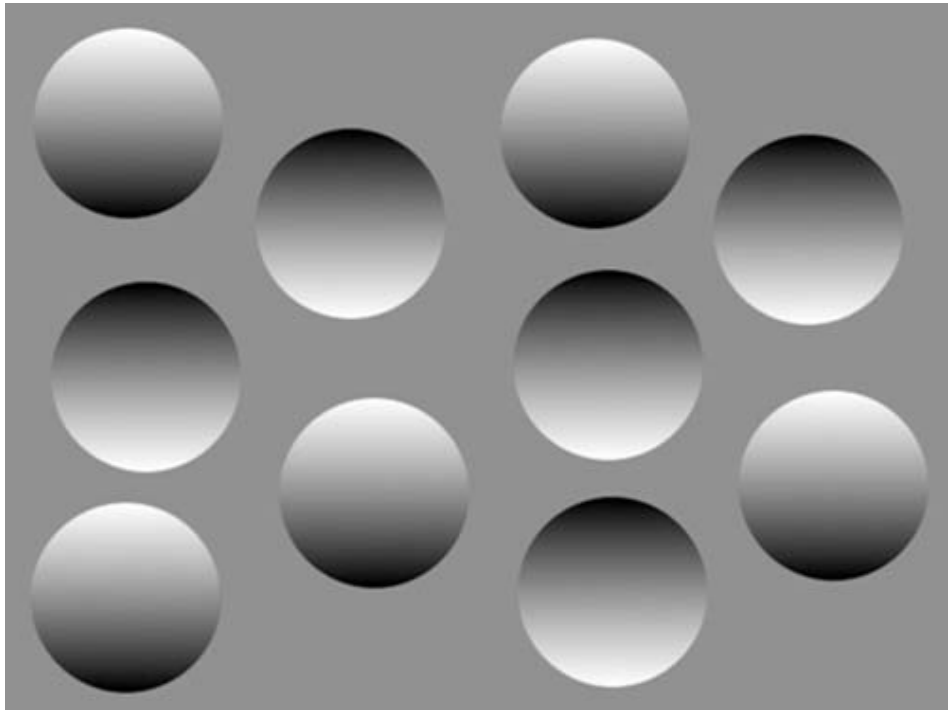
Rules of 3D geometry



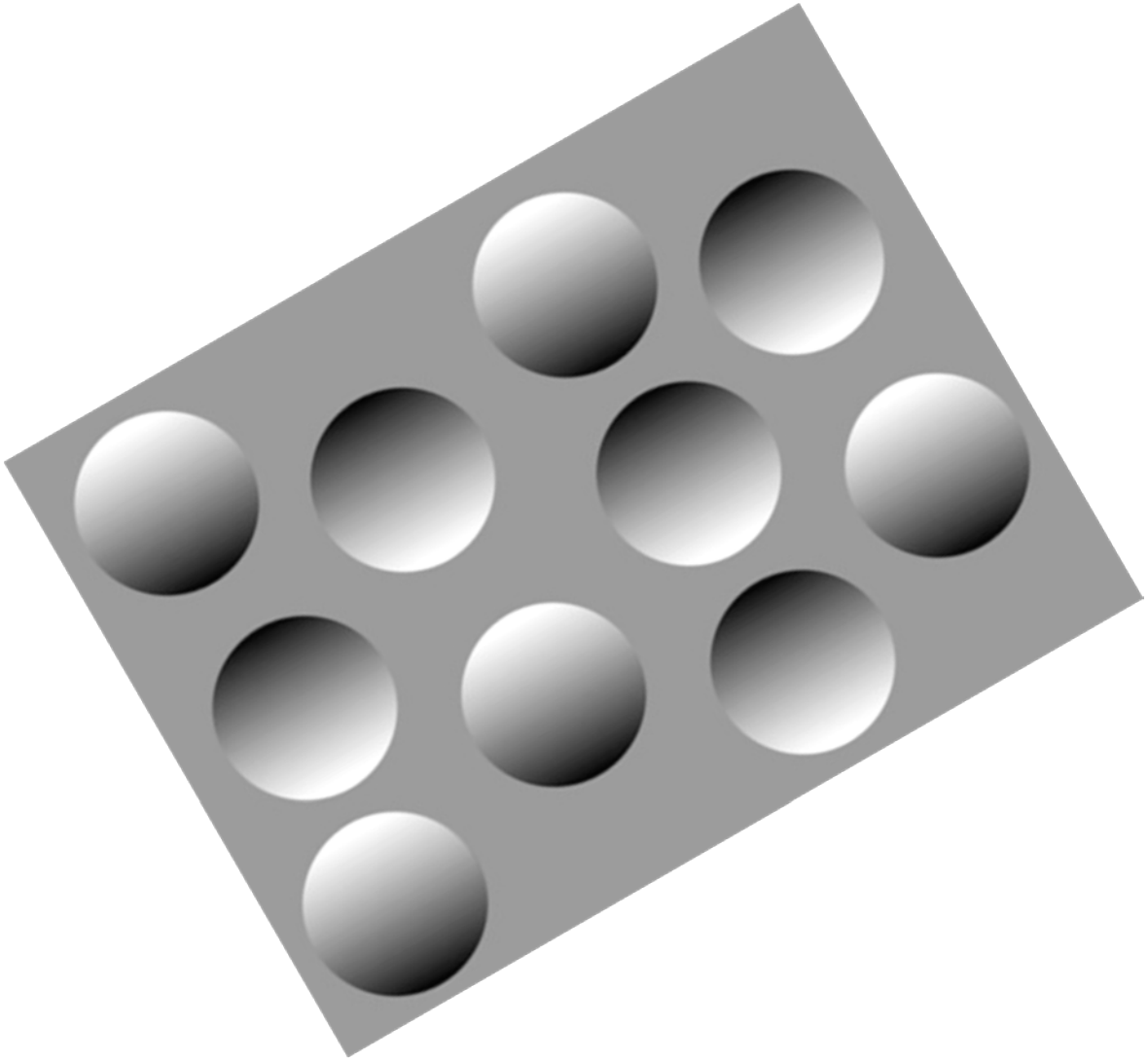
Rules of 3D geometry



Light comes from above



Light comes from above



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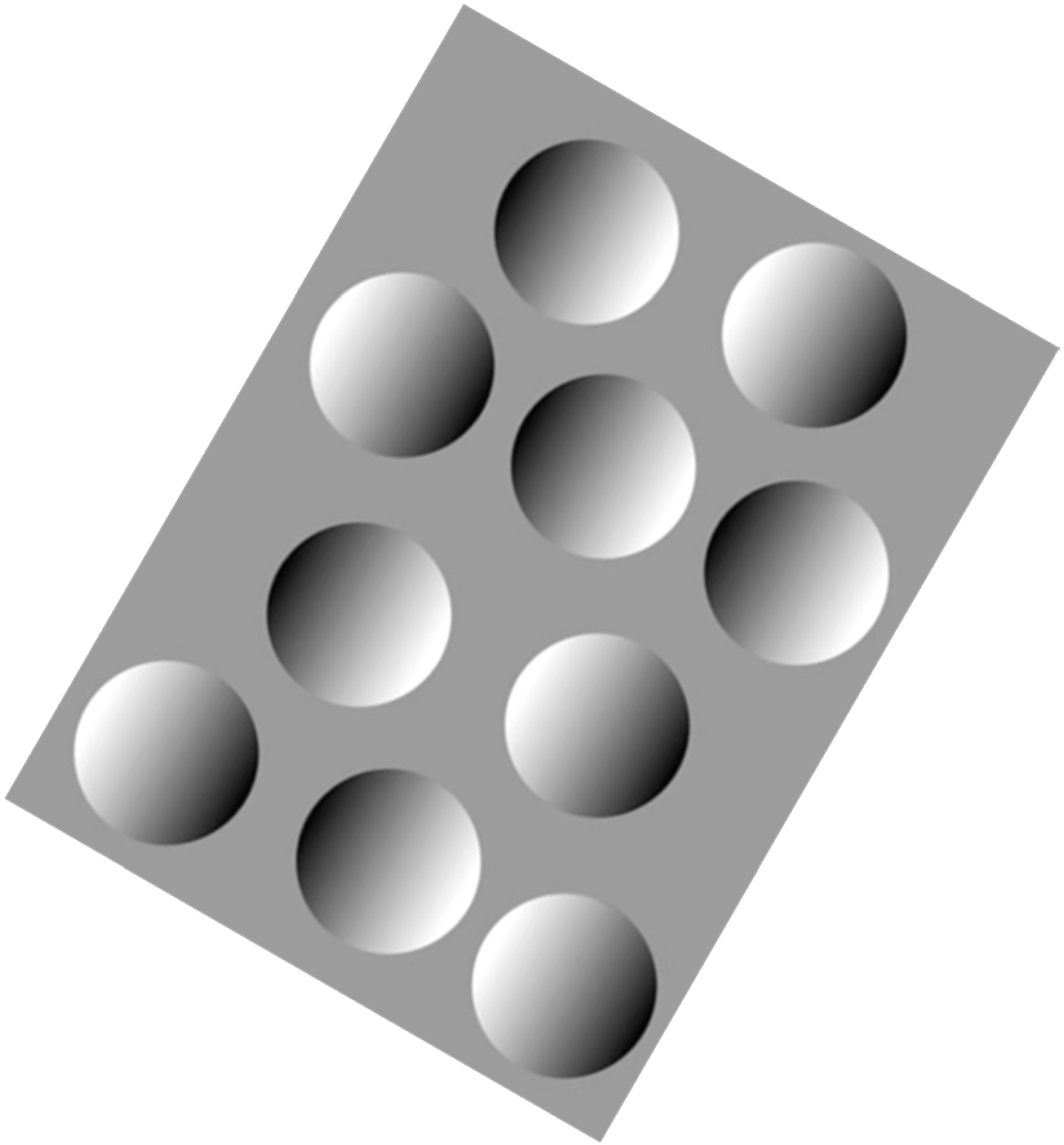

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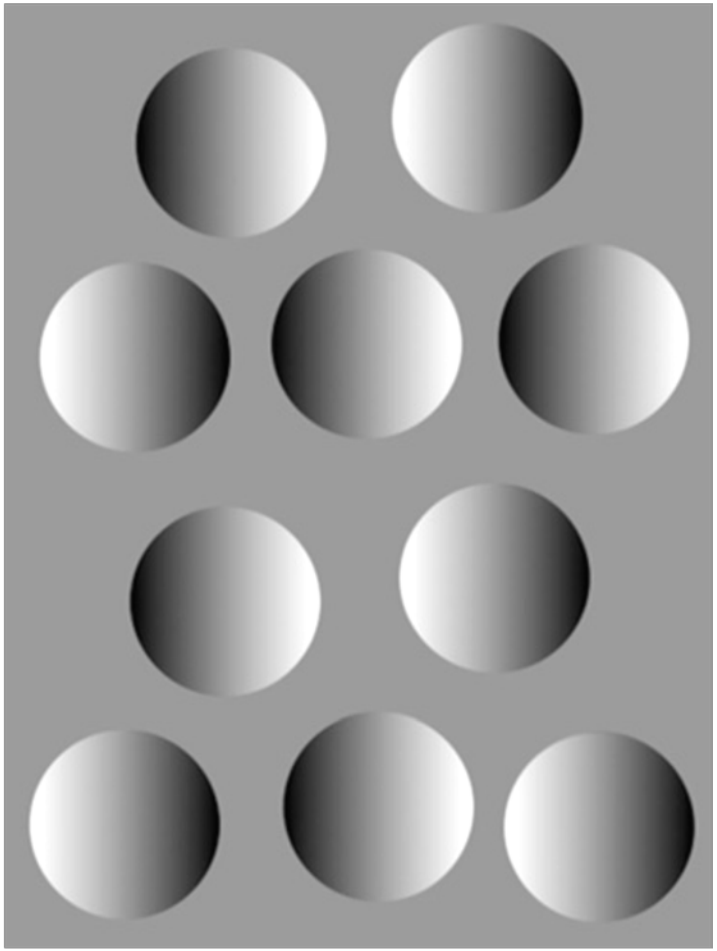

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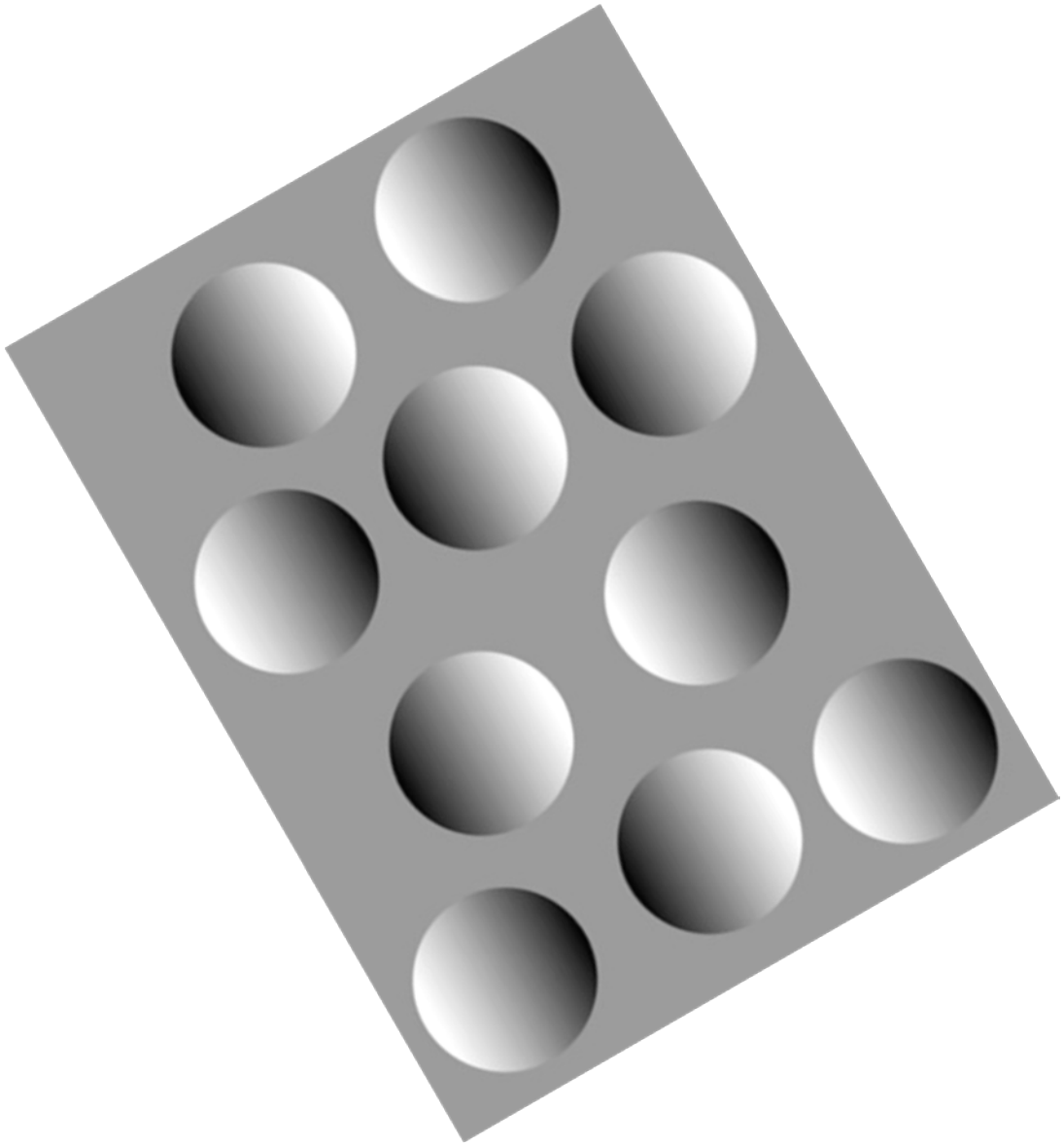

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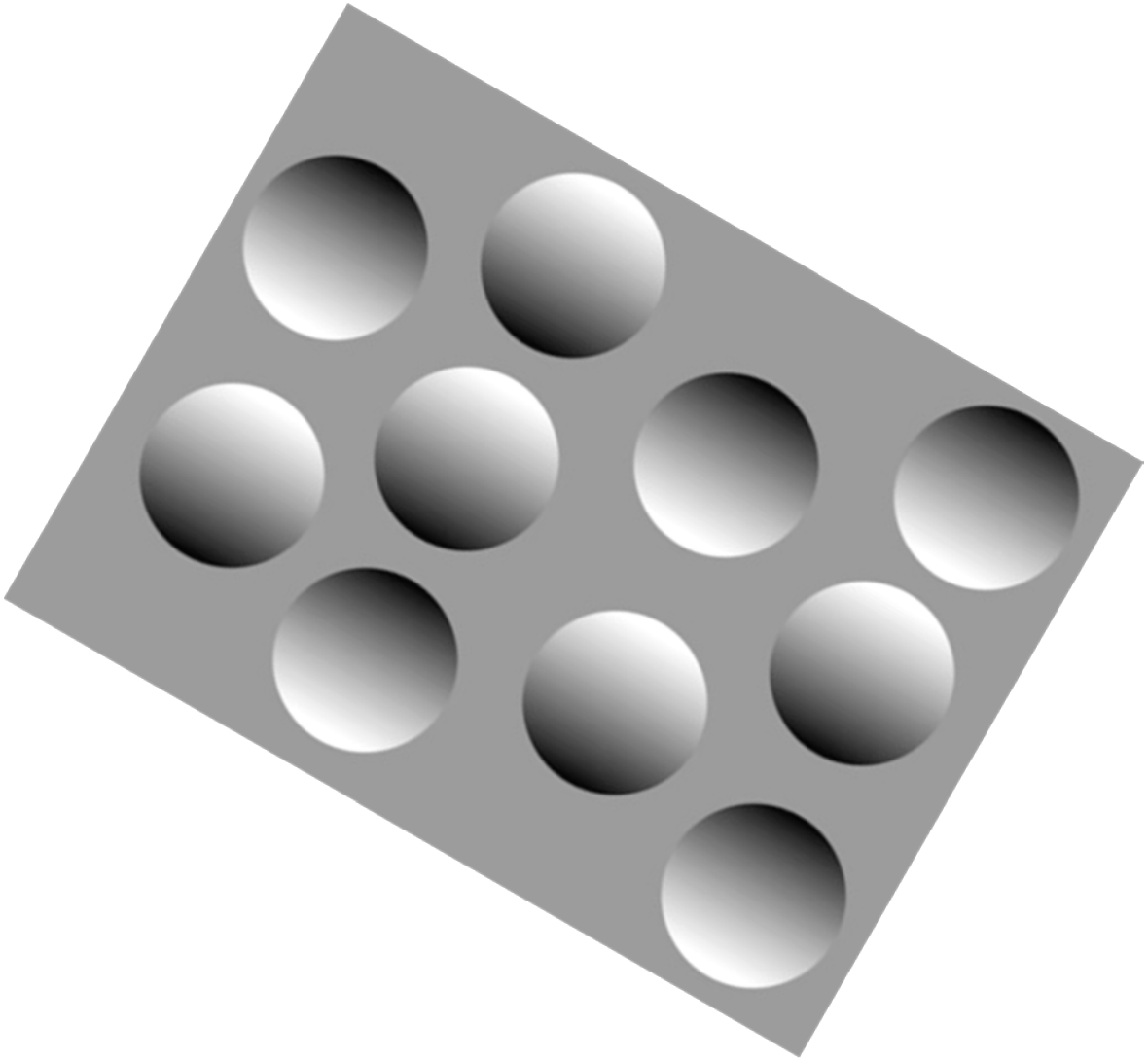

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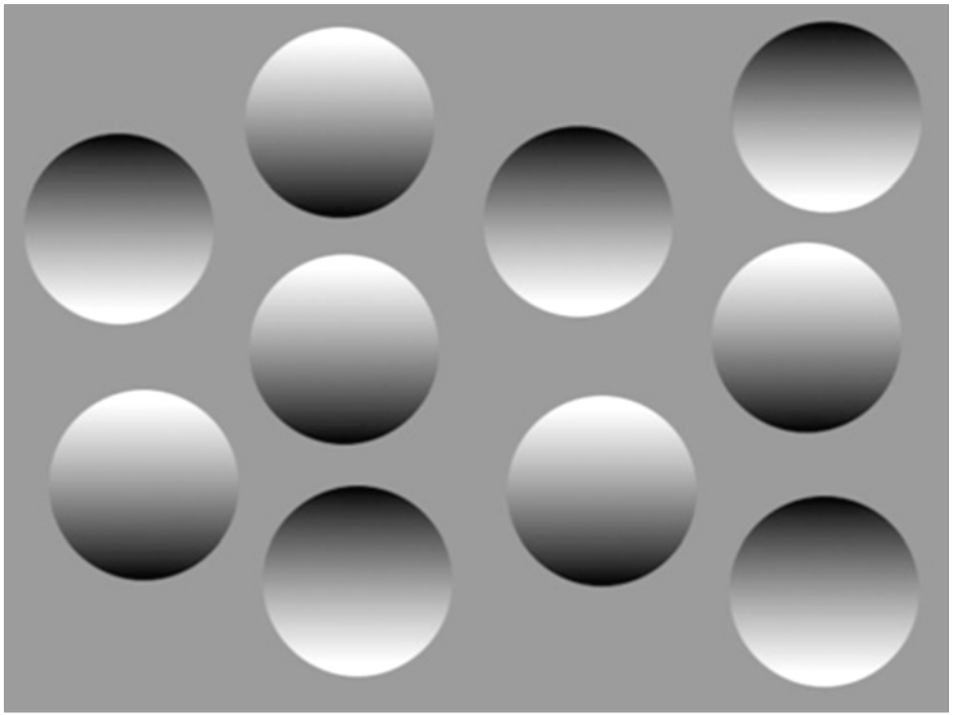
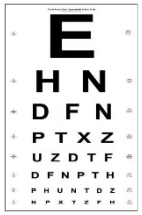
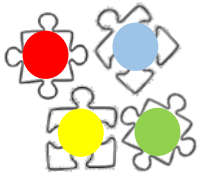
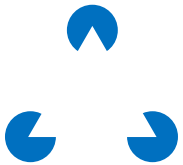
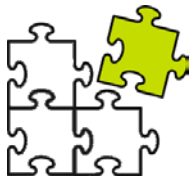




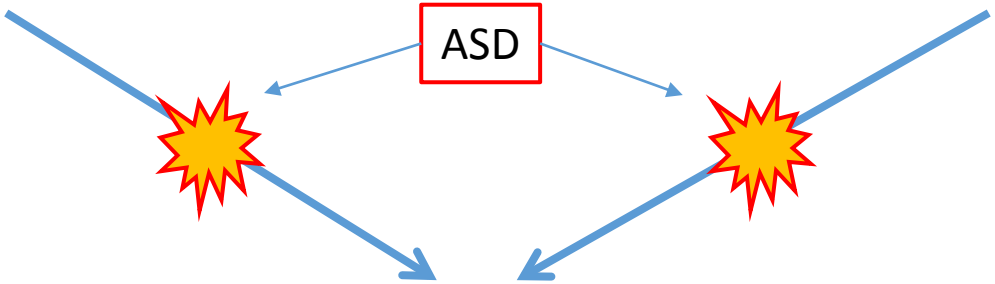




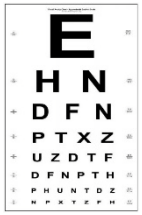


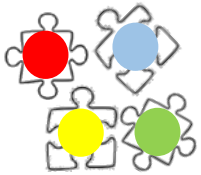
‘SENSATION’

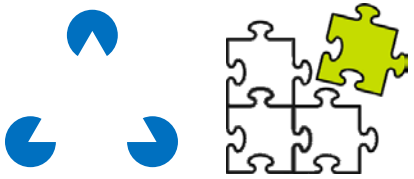
‘PRIOR KNOWLEDGE’



‘PERCEPTION’

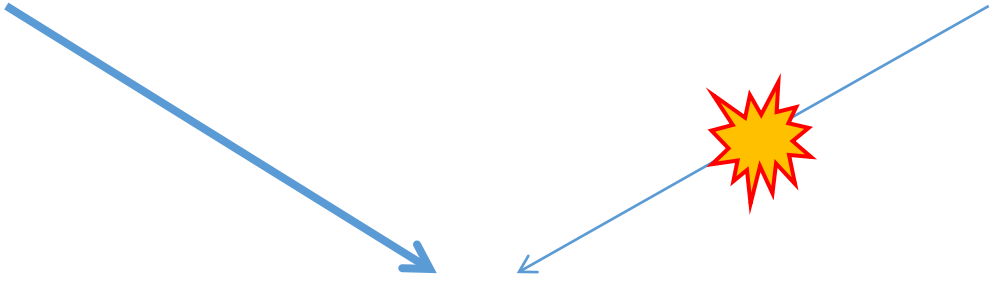






‘SENSATION’

‘PRIOR KNOWLEDGE’



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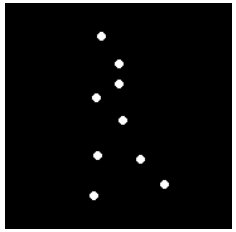
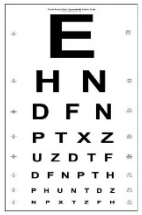
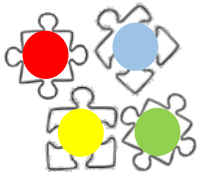
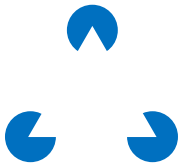
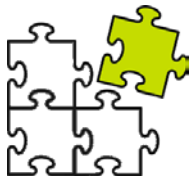


Weak Central Coherence
(WCC, Happe & Frith, 2006)





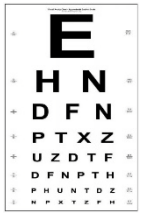


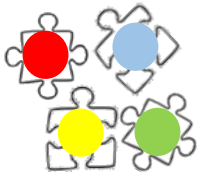


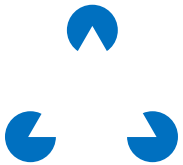
‘SENSATION’

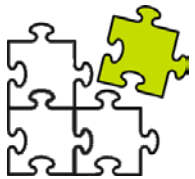
‘PRIOR KNOWLEDGE’

‘PERCEPTION’



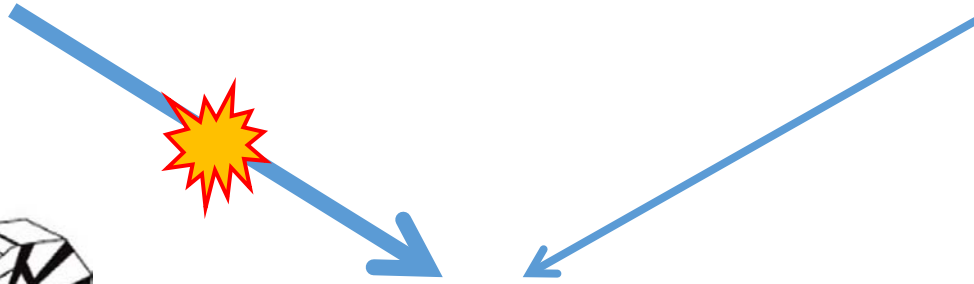




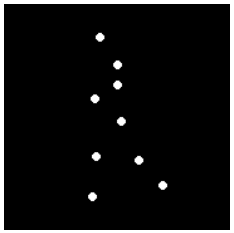


‘SENSATION’

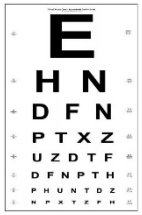
‘PRIOR KNOWLEDGE’

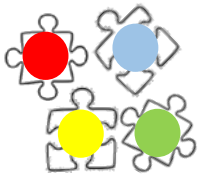


‘PERCEPTION’

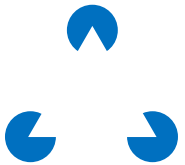


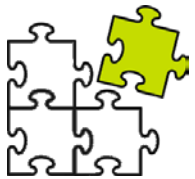
Enhanced Perceptual Function
(EPP, Mottron et al, 2006)





‘SENSATION’





‘PRIOR KNOWLEDGE’

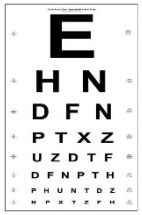
Unification: Bayesian model of ASD (Pellicano & Burr, 2010)

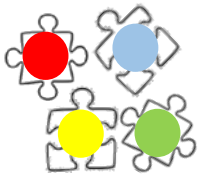
‘PERCEPTION’

ASD

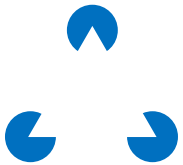
Low → High

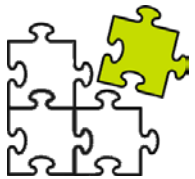
More → Less





‘SENSATION’





‘PRIOR KNOWLEDGE’

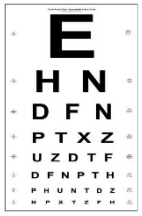
Unification: Bayesian model of ASD (Pellicano & Burr, 2010)

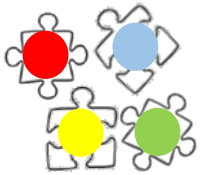
‘PERCEPTION’

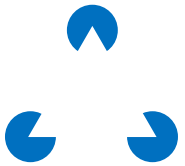
Low → High

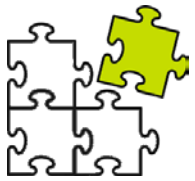
ASD

More → Less









'SENSATION'

'PRIOR KNOWLEDGE'

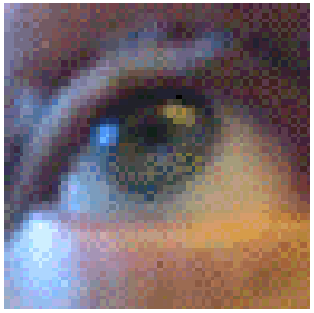
Unification: Bayesian model of ASD (Pellicano & Burr, 2010)

'PERCEPTION'

ASD

Low → High

More → Less



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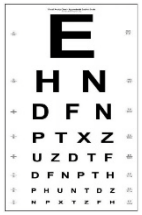
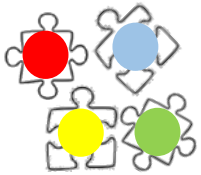
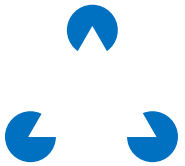
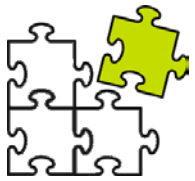








‘SENSATION’

‘PRIOR KNOWLEDGE’

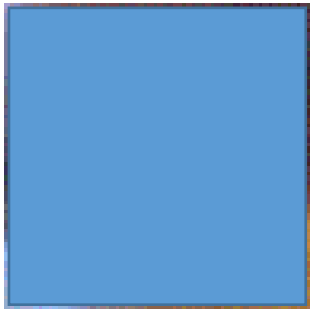
Unification: Bayesian model of ASD (Pellicano & Burr, 2010)

‘PERCEPTION’

ASD

Low → High

More → Less



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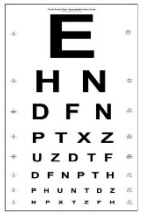
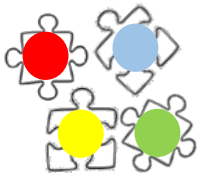
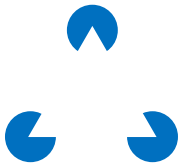
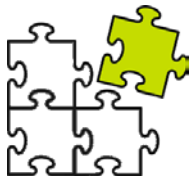








‘SENSATION’

‘PRIOR KNOWLEDGE’

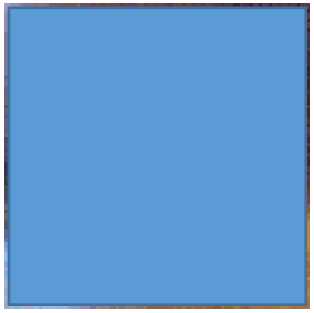
Unification: Bayesian model of ASD (Pellicano & Burr, 2010)

‘PERCEPTION’

Motion detection

30 students
(not ASD)

Autism Quotient Questionnaire



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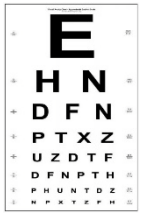
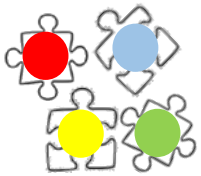
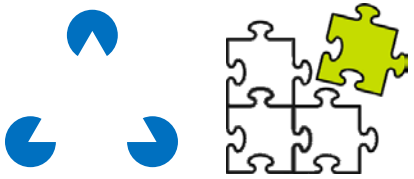




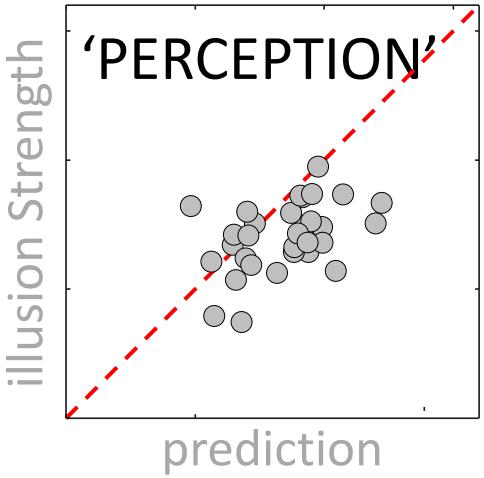


‘SENSATION’

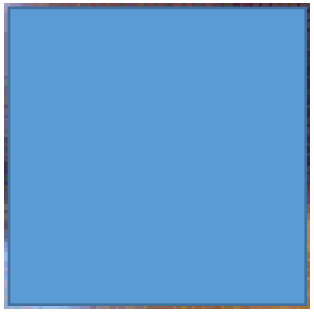
‘PRIOR KNOWLEDGE’

Unification: Bayesian model of ASD (Pellicano & Burr, 2010)

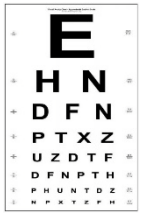
Motion detection

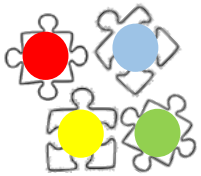


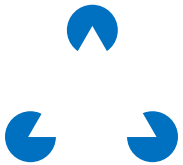
Autism Quotient Questionnaire

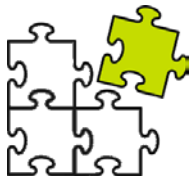


Powell, Meredith, McMillin & Freeman (2016) *Psychological Science*







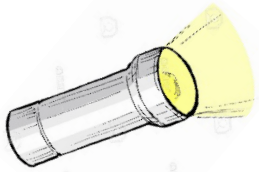


‘SENSATION’

‘PRIOR KNOWLEDGE’

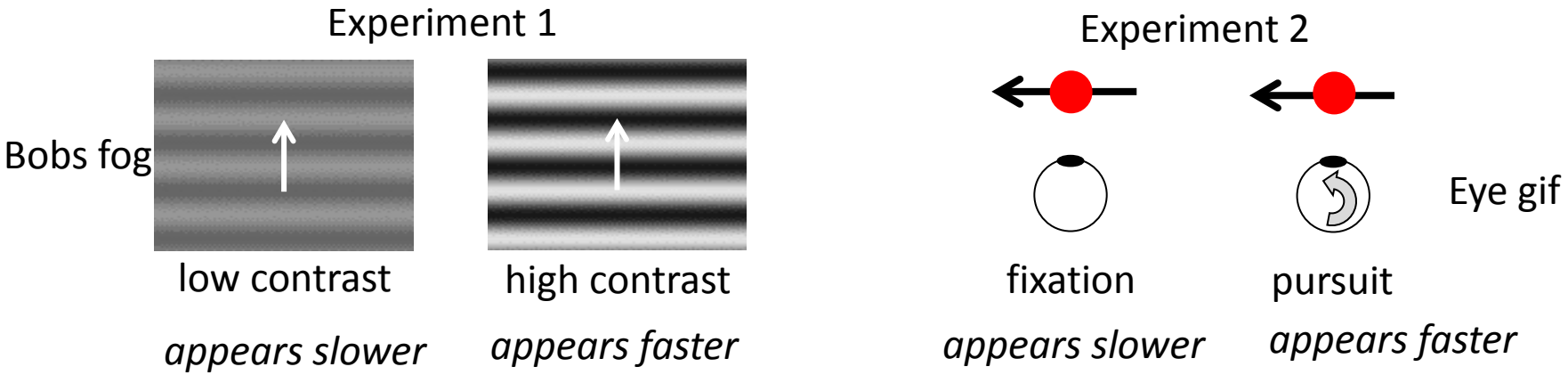
ASD

‘PERCEPTION’



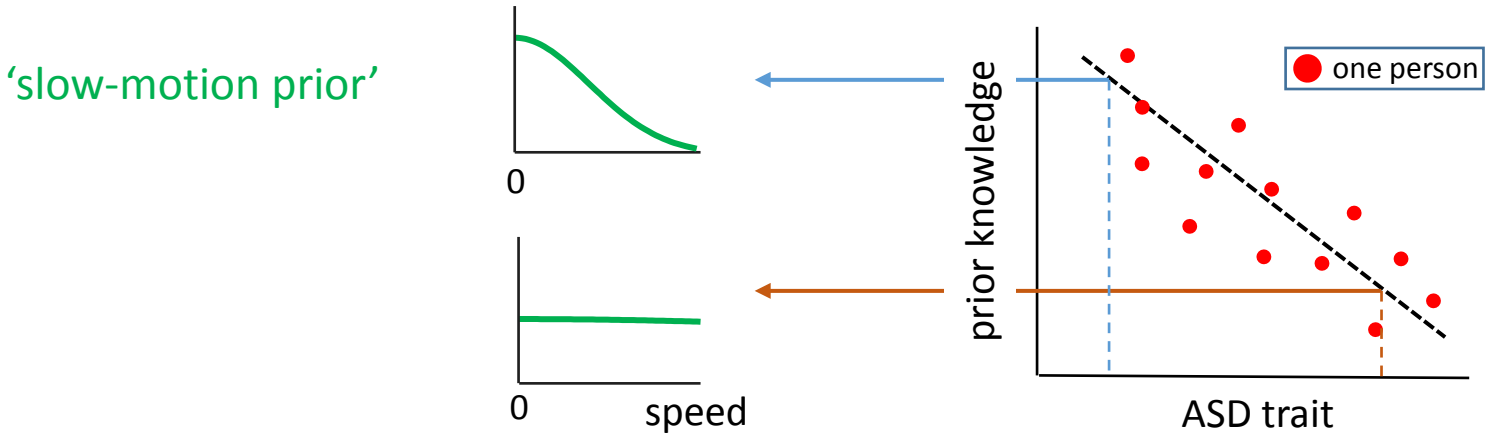
‘ATTENTION’

Powell, Meredith, McMillin & Freeman (in press), *Psychological Science*

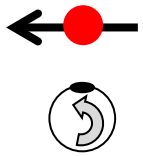


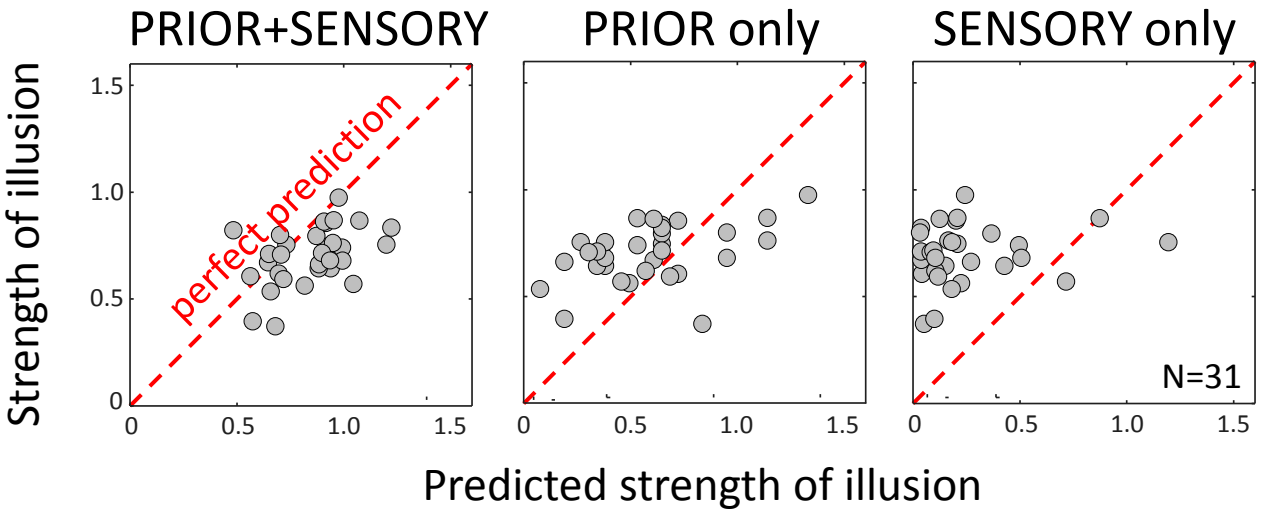
a) Measured motion detection = 'SENSATION'

b) Measured ASD traits = 'PRIOR KNOWLEDGE'

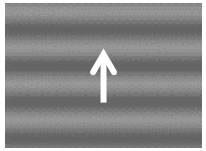


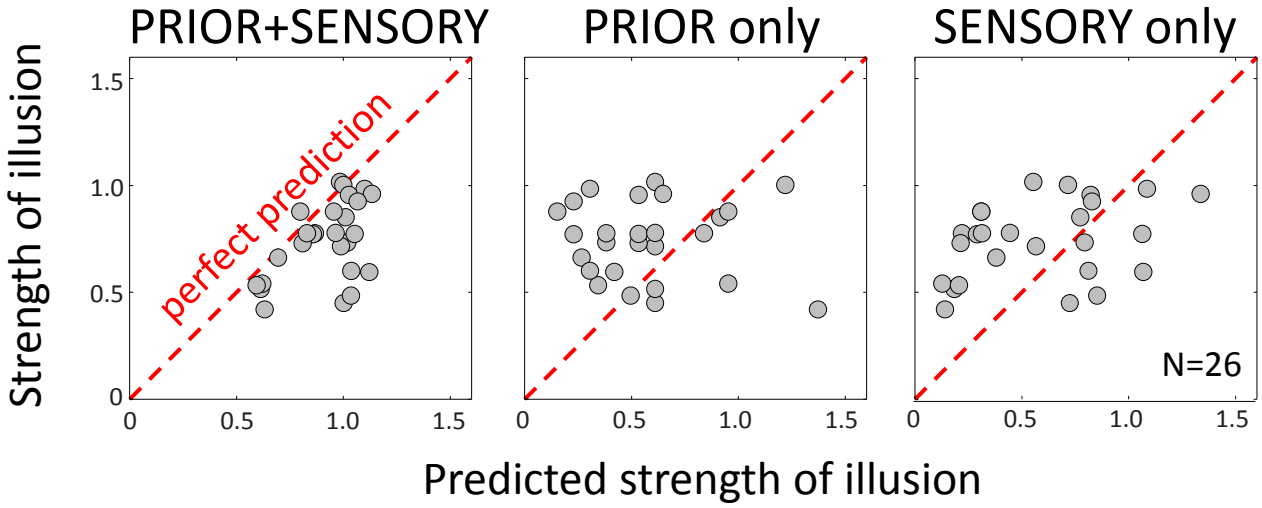
Experiment 1





Experiment 2





Simmons et al (2009): “The way forward must be for vision scientists… to collaborate with those of a more clinical orientation.”