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Edition & Layout Siwei Luo

An Experiment of Color-memorizing concerning Factors Centering Attention Affecting Working Memories

Siwei Luo; Junyan Luan; Guozun Sun; Yuehan Qu

23 May 2024

deBettencourt, M.T., Keene, P.A., Awh, E. et al. Real-time triggering reveals concurrent lapses of attention and working memory. *Nat Hum Behav* **3**, 808–816 (2019). https://doi.org/10.1038/s41562-019-0606-6

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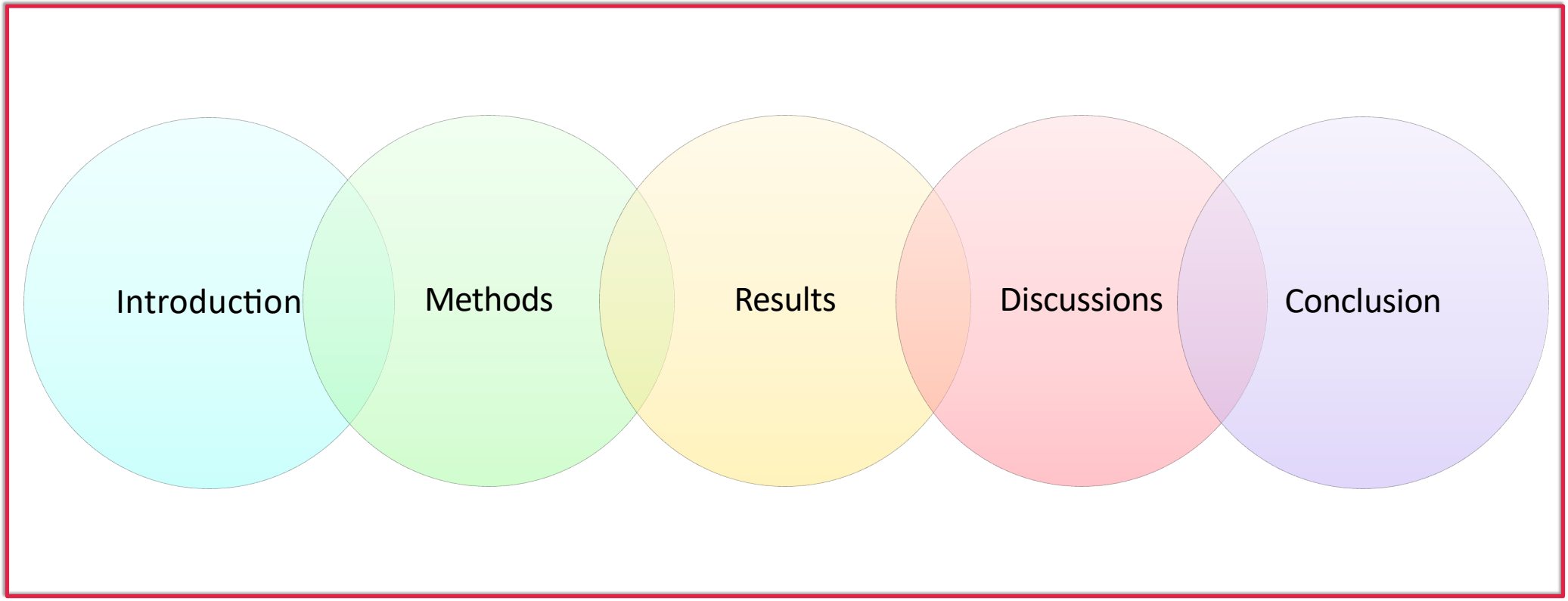
Table of Contents



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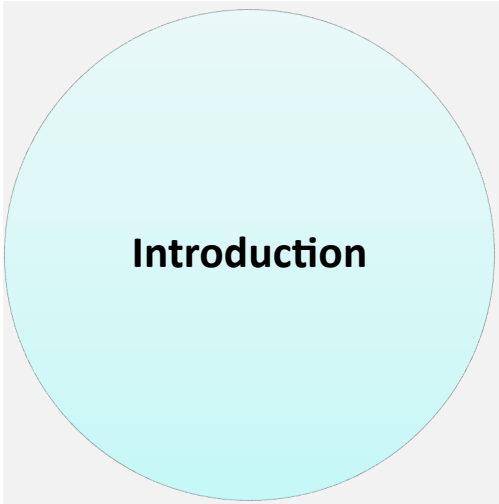
Section I



Memory Brief Classification

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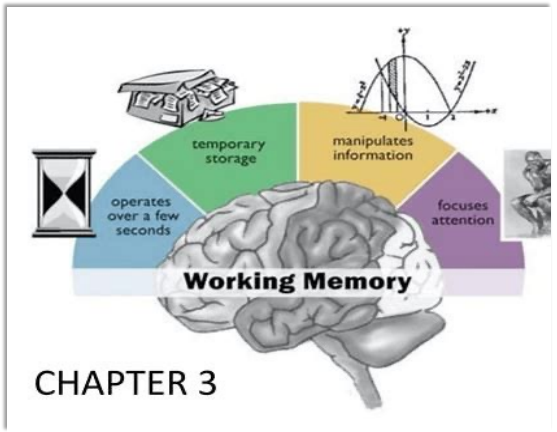
Sensory Memory

Long-term Memory



Working Memory

1. Sperling, G. (1960). The information available in brief visual presentations. *Psychological Monographs: General and Applied*, **74**(11), 1-29.
2. Vandewalle, G., Maquet, P. & Dijk, D. J. Light as a modulator of cognitive brain function. *Trends Cogn. Sci.* **13**, 429–438 (2009).
3. Tulving, E. (1972). Episodic and semantic memory. In E. Tulving & W. Donaldson (Eds.), *Organization of Memory* (pp. 381-403). Academic Press.
4. Baddeley, A. D. (2003). Working memory: Looking back and looking forward. *Nature Reviews Neuroscience*, **4**(10), 829-839.

Factors of Working Memory

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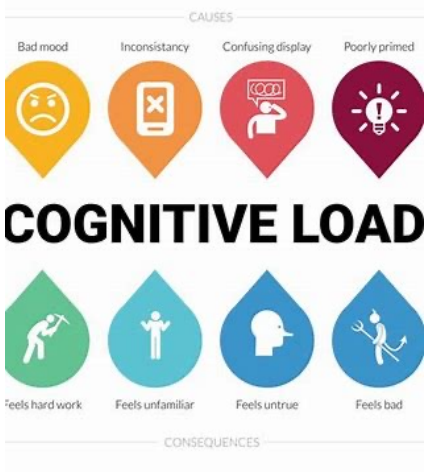

Cognitive Load

Stress & Emotional State

Attention

1. Cowan, N. (2010). The magical number 4 in short-term memory: A reconsideration of mental storage capacity. *Behavioral and Brain Sciences*, **24**(1), 87-185.
2. Sweller, J. (2011). Cognitive load theory. *Psychology of Learning and Motivation*, **55**, 37-76.
3. Arnsten, A. F. (2009). Stress signalling pathways that impair prefrontal cortex structure and function. *Nature Reviews Neuroscience*, **10**(6), 410-422.

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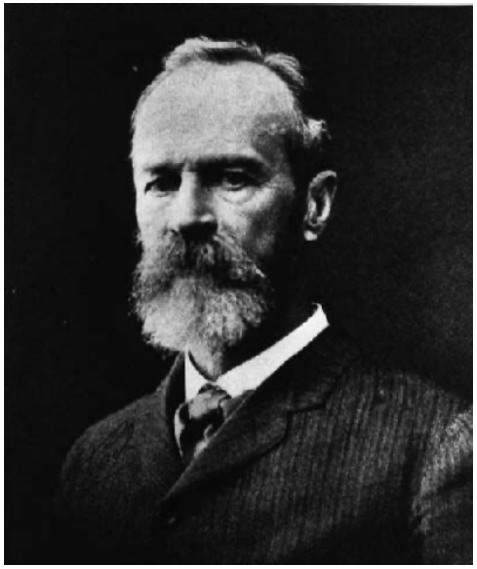
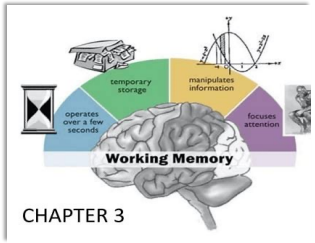


William Jane

Attention

World around Us

Contents of Minds



James, W. (1890). *The Principles of Psychology*. Dover Publications.

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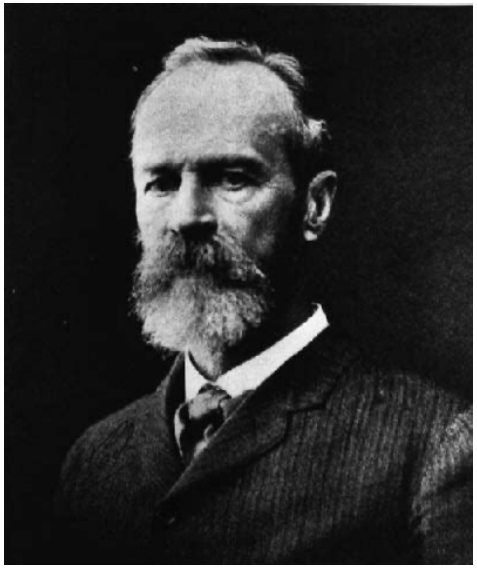


William Jane

Attention

World around Us

Sensorial

Attention

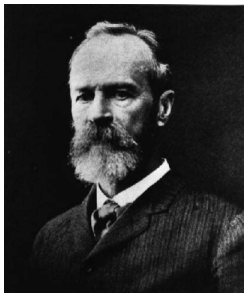
Contents of Minds

Intellectual

Working Memory

James, W. (1890). *The Principles of Psychology*. Dover Publications.

William Jane's Opinion 1890



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World around Us	Sensorial	**Attention**
Contents of Minds	Intellectual	**Working Memory**

Interesting Correspondence !

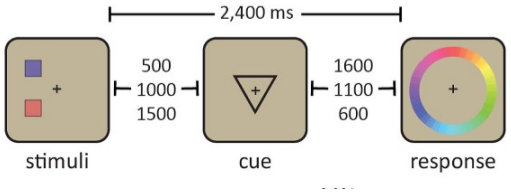
James, W. (1890). *The Principles of Psychology*. Dover Publications.

Article

Shared mechanisms underlie the control of working memory and attention

https://doi.org/10.1038/s41586-021-03390-w
Received: 15 April 2020

Matthew F. Panichello[1] & Timothy J. Buschman[1,2]✉



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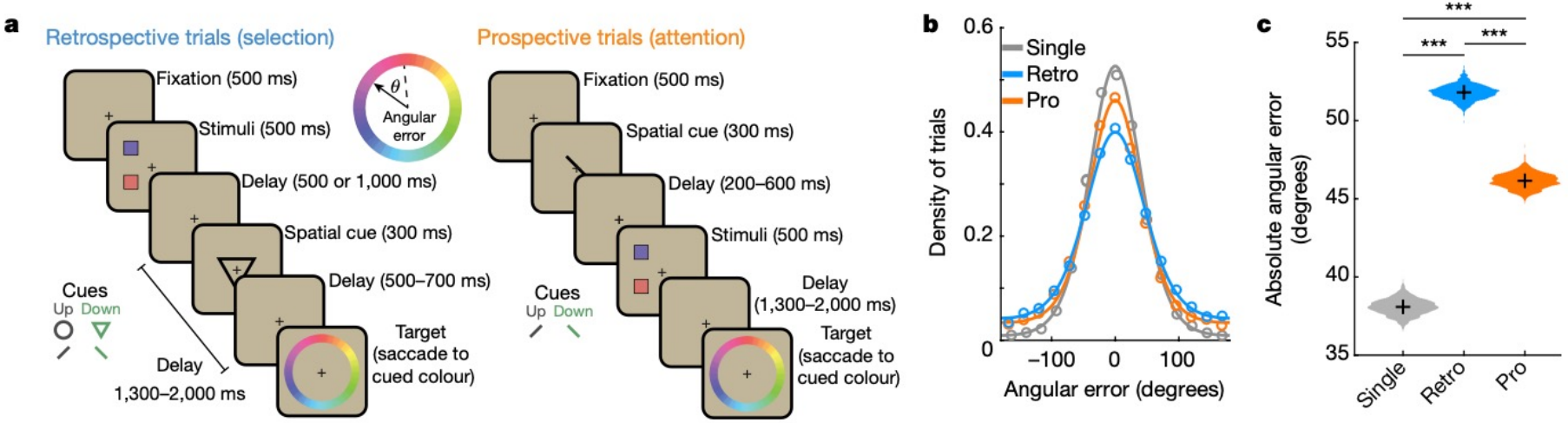

Selection

Retrospective

Prospective

Panichello, M.F., Buschman, T.J. Shared mechanisms underlie the control of working memory and attention. *Nature* **592**, 601–605 (2021). https://doi.org/10.1038/s41586-021-03390-w

Article

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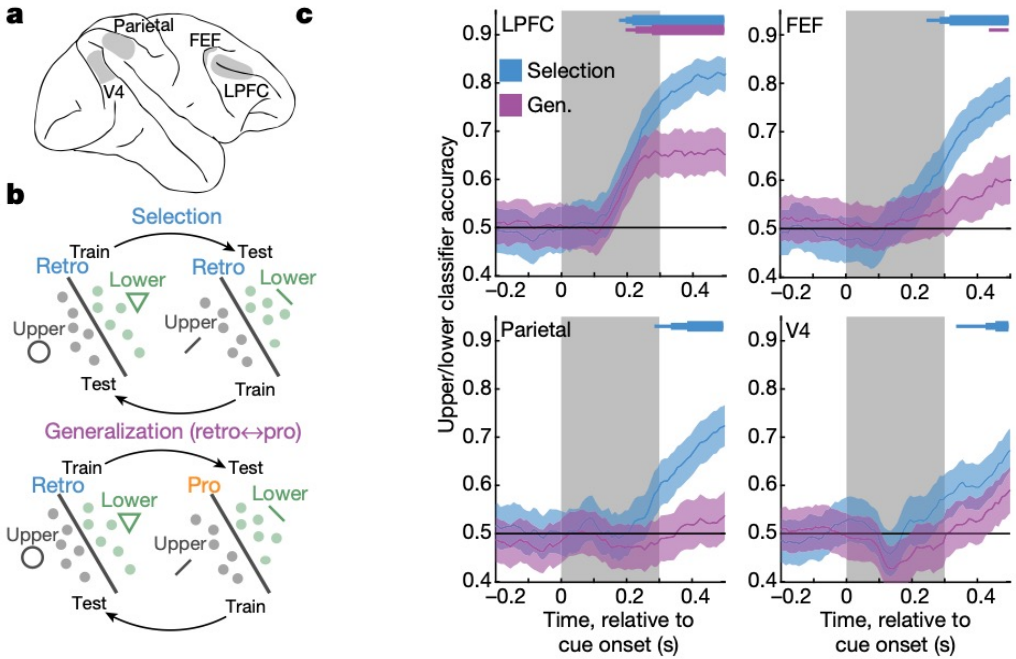

Controller LPFC ✅

A General Controller

Panichello, M.F., Buschman, T.J. Shared mechanisms underlie the control of working memory and attention. *Nature* **592**, 601–605 (2021). https://doi.org/10.1038/s41586-021-03390-w

Article

Shared mechanisms underlie the control of working memory and attention

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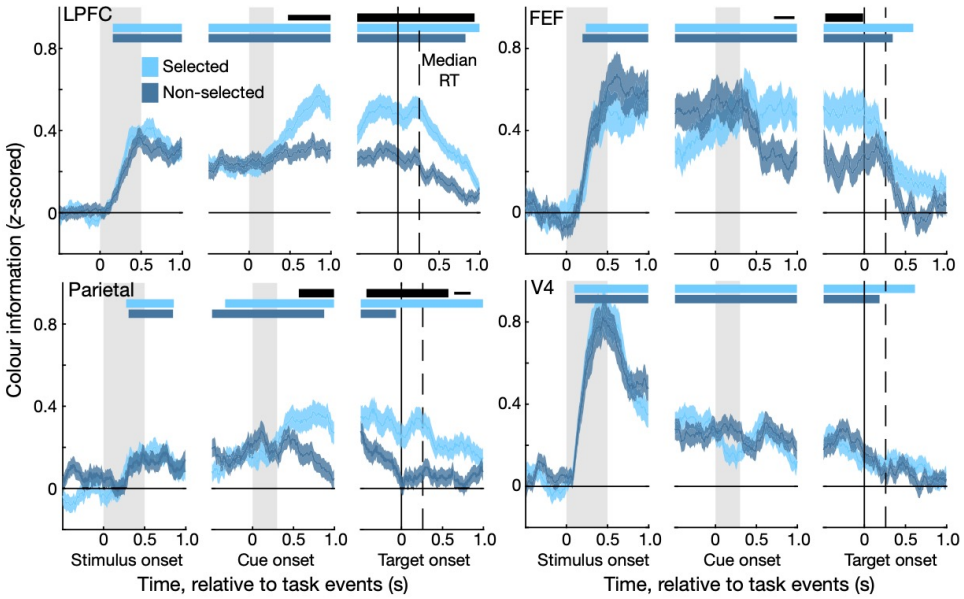
Edition & Layout Siwei Luo
Search Siwei Luo



Controller LPFC ✅

Controller Parietal ✅

Panichello, M.F., Buschman, T.J. Shared mechanisms underlie the control of working memory and attention. *Nature* **592**, 601–605 (2021). https://doi.org/10.1038/s41586-021-03390-w

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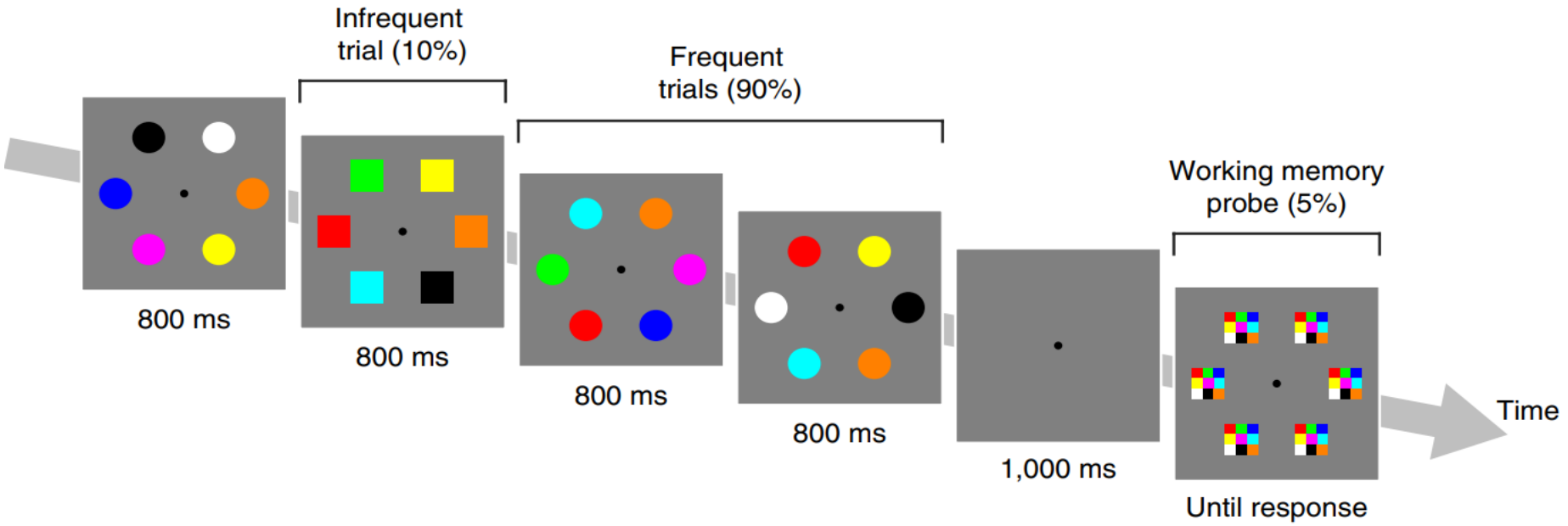
Section II

Basic Design

Content Guozun Sun
Layout Guozun Sun Siwei Luo



Statistics Need Recording

Rate of Correction ✅

Time ⏰

Enhancement: How do we encode colors?

Method I

Content Guozun Sun
Idea Guozun Sun
Layout Guozun Sun Siwei Luo

Name

Or

Vision

Match ?

Guide to Change

Red Green Blue

✅

Name Encoding ⬆️

Red Green Blue

Red Green Blue

Red Green Blue

❌

Name Encoding ⬇️

Enhancement:
How do we encode colors?

Or

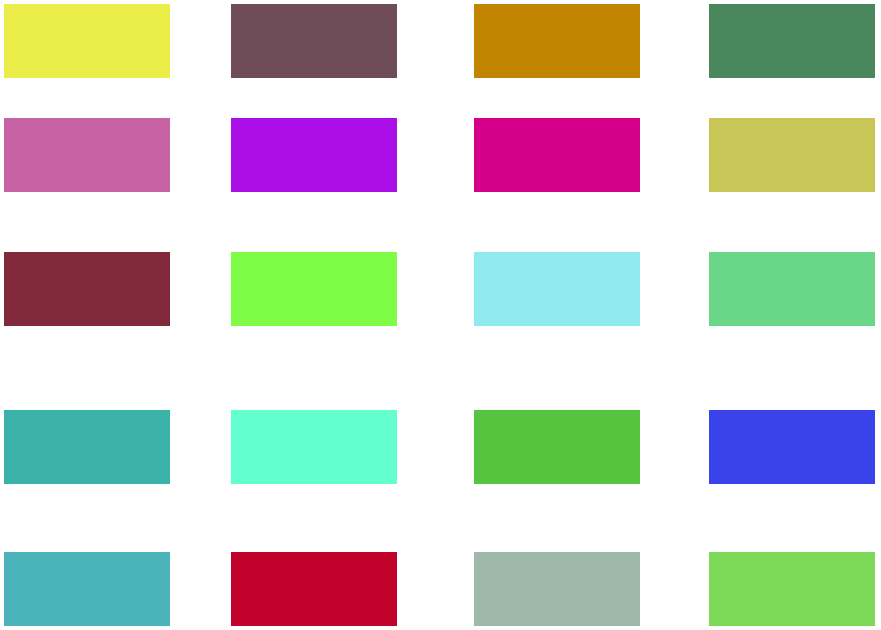
Name

Vision

Idea Junyan Luan Siwei Luo
Design Junyan Luan
Perform Junyan Luan
Layout Junyan Luan Siwei Luo

Method II

Bias ✗



Name Encoding ⬇️

Random RGB

Pre-experiment

9 Colors

Name ✗

Enhancement:
How do we encode colors?

Or

Name

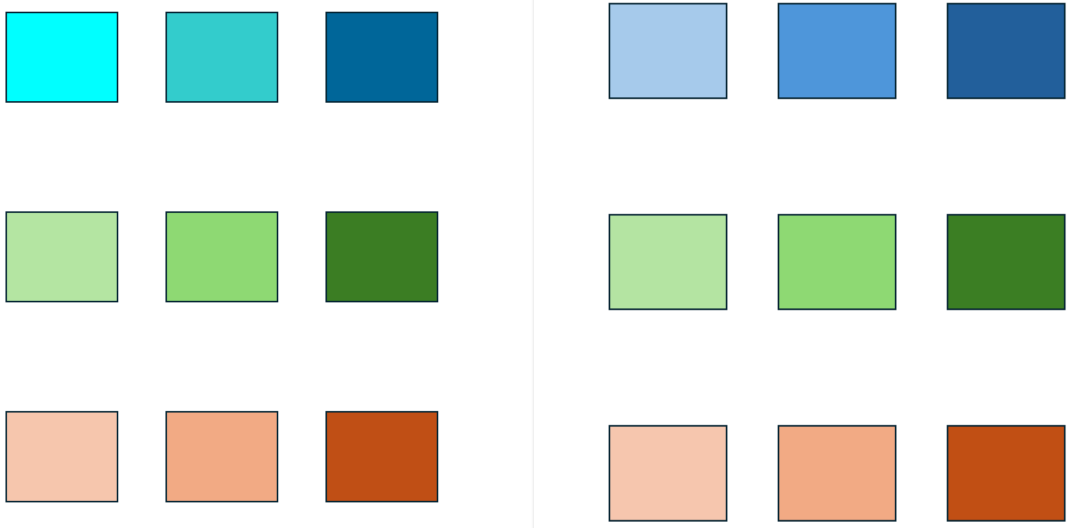
Vision

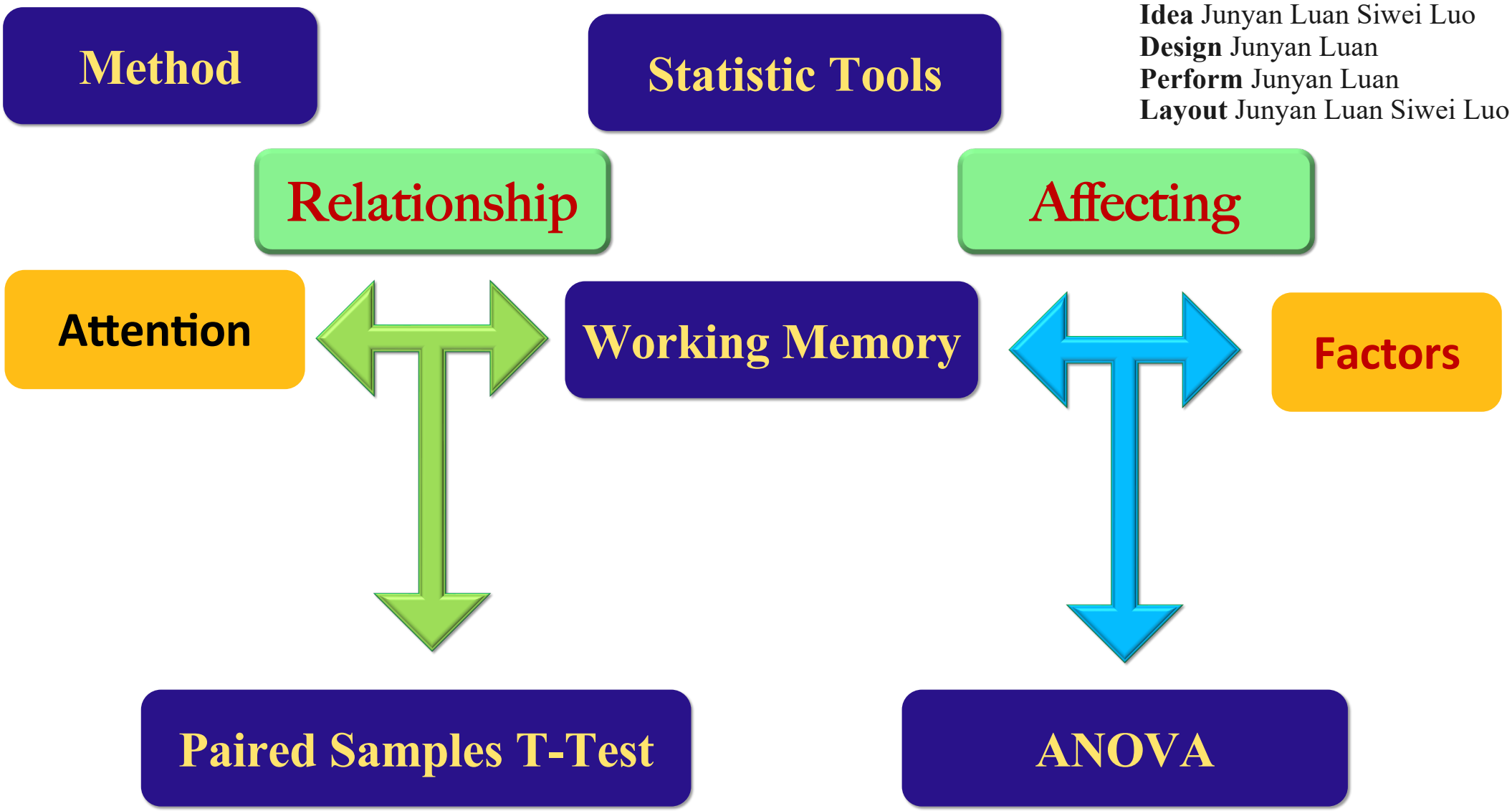
Idea Yuehan Qu & Siwei Luo
Design Yuehan Qu
Perform Yuehan Qu
Layout Siwei Luo

HARD to Name → **Name Encoding** ⬇️

Method III-1

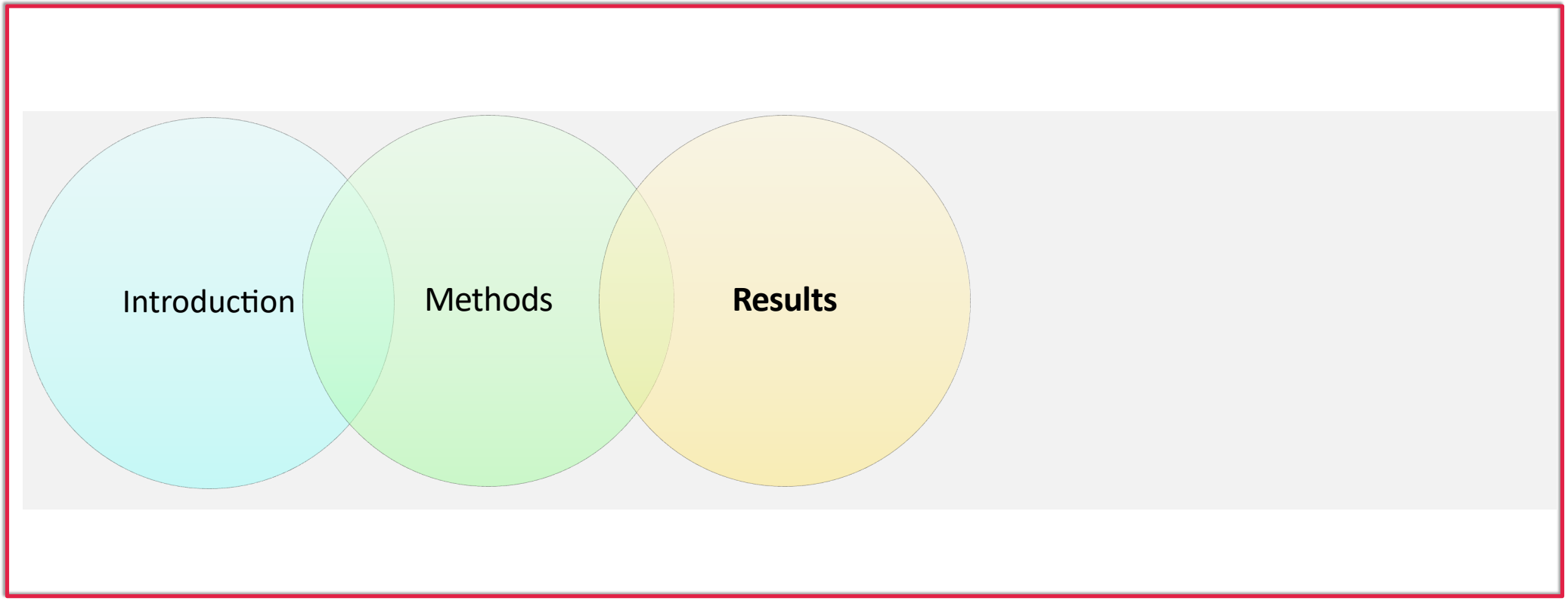
Method III-2




Method
Statistic Tools
Idea Junyan Luan Siwei Luo
Design Junyan Luan
Perform Junyan Luan
Layout Junyan Luan Siwei Luo
Relationship
Affecting
Attention
Working Memory
Factors
Paired Samples T-Test
ANOVA

Edit & Layout Siwei Luo

Section III



Result 1

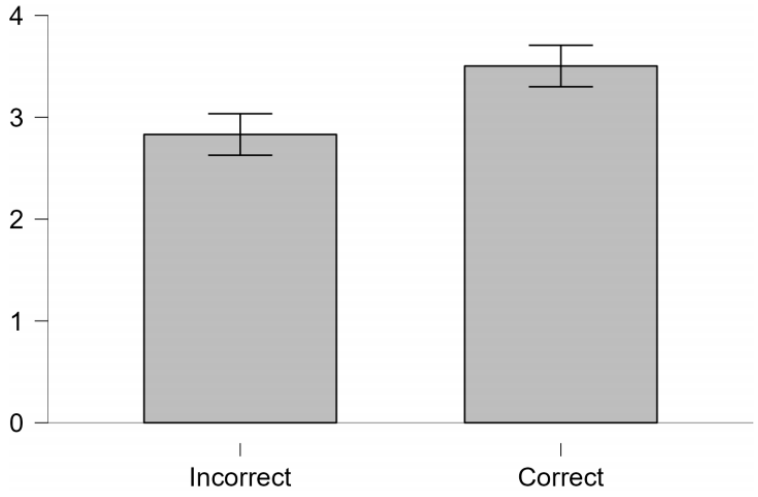
Relationship

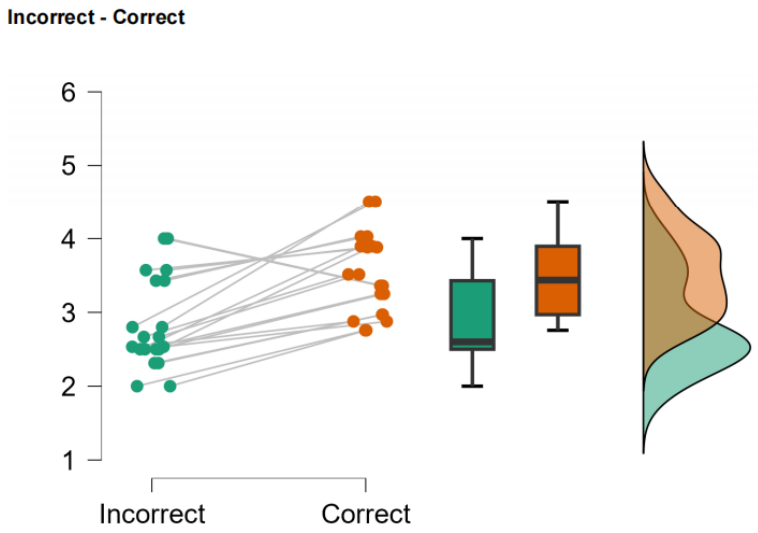
Content Junyan Luan
Layout Junyan Luan & Siwei Luo
Analysis Junyan Lan

Attention ⟷ **Working Memory**

Paired Samples T-Test

Measure 1		Measure 2	t	df	p
Incorrect	-	Correct	−4.883	19	< .001





Basic Experiment

Result 1

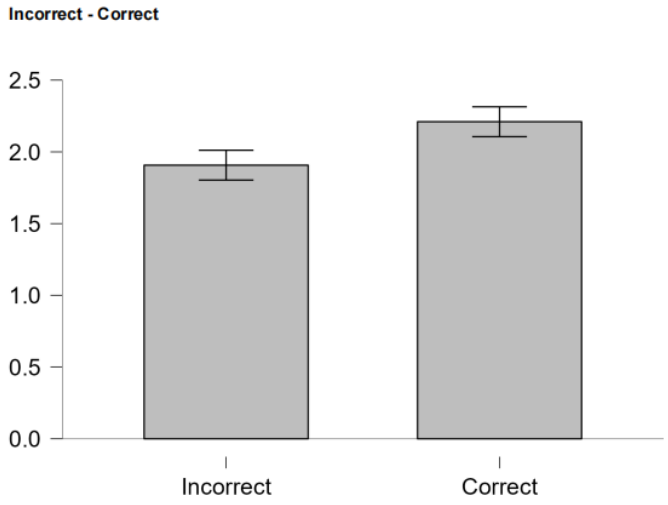
Relationship

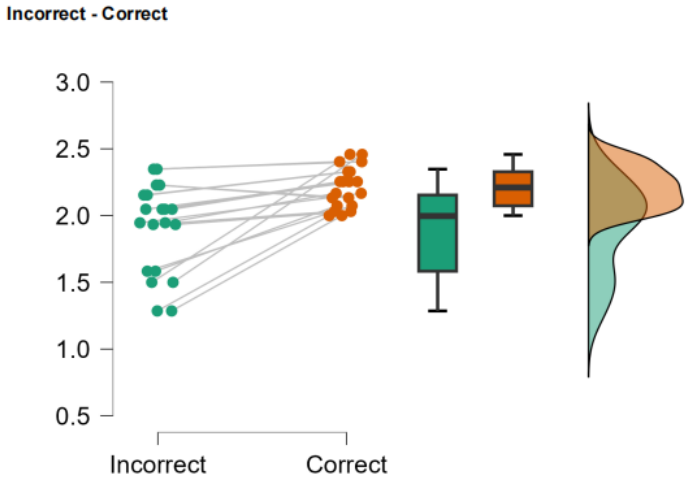
Content Junyan Luan
Layout Junyan Luan & Siwei Luo
Analysis Junyan Lan

Attention ⟷ **Working Memory**

Paired Samples T-Test

Measure 1		Measure 2	t	df	p
Incorrect	-	Correct	−4.312	19	< .001





Enhanced Experiment

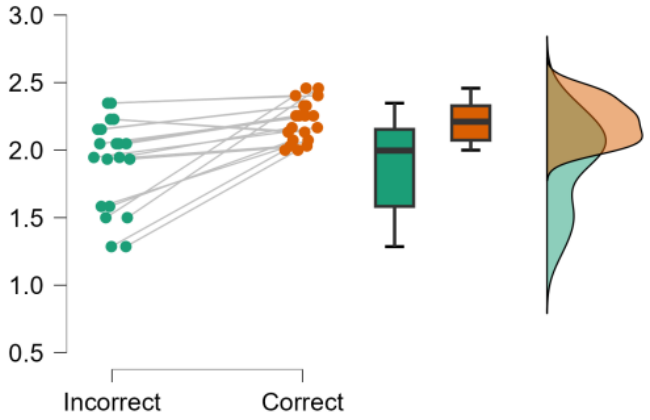
Result 2

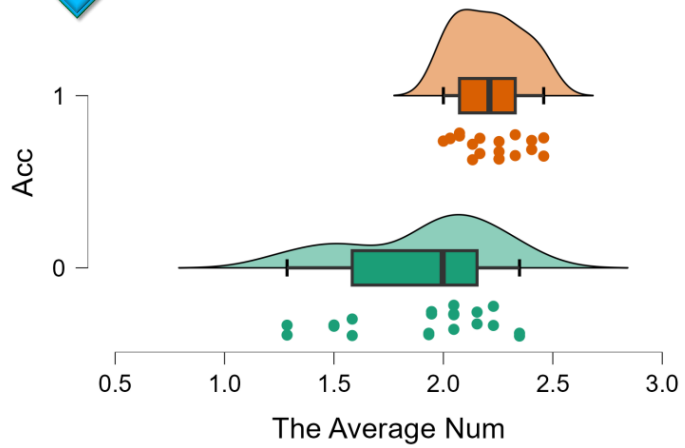
How do we encode colors?

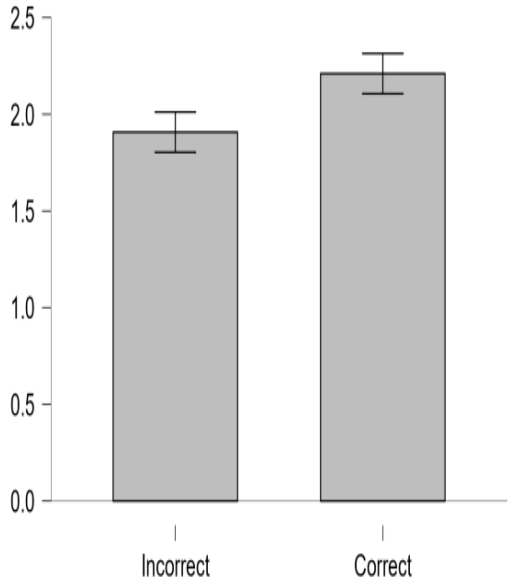
Content Junyan Luan
Layout Junyan Luan & Siwei Luo
Analysis Junyan Lan

Working Memory

Factors







Paired Samples T-Test

Measure 1		Measure 2	t	df	p
Incorrect	-	Correct	−4.312	19	< .001

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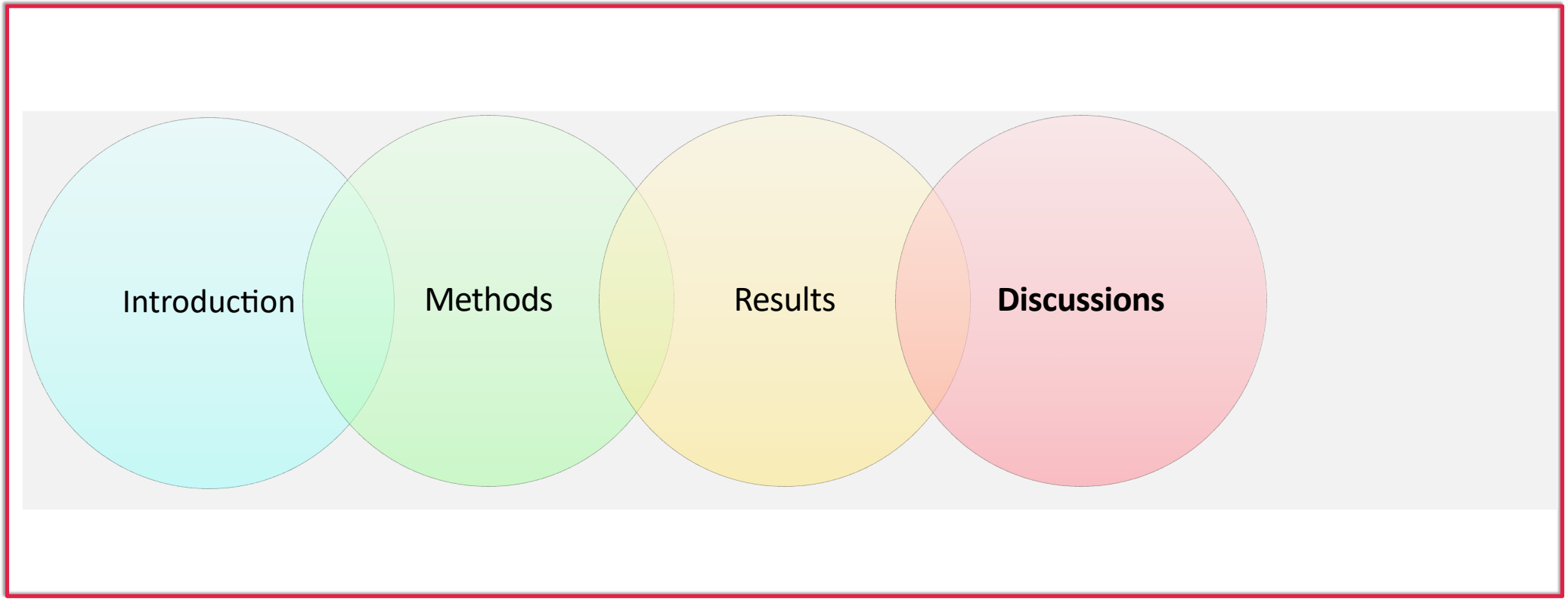
Section IV



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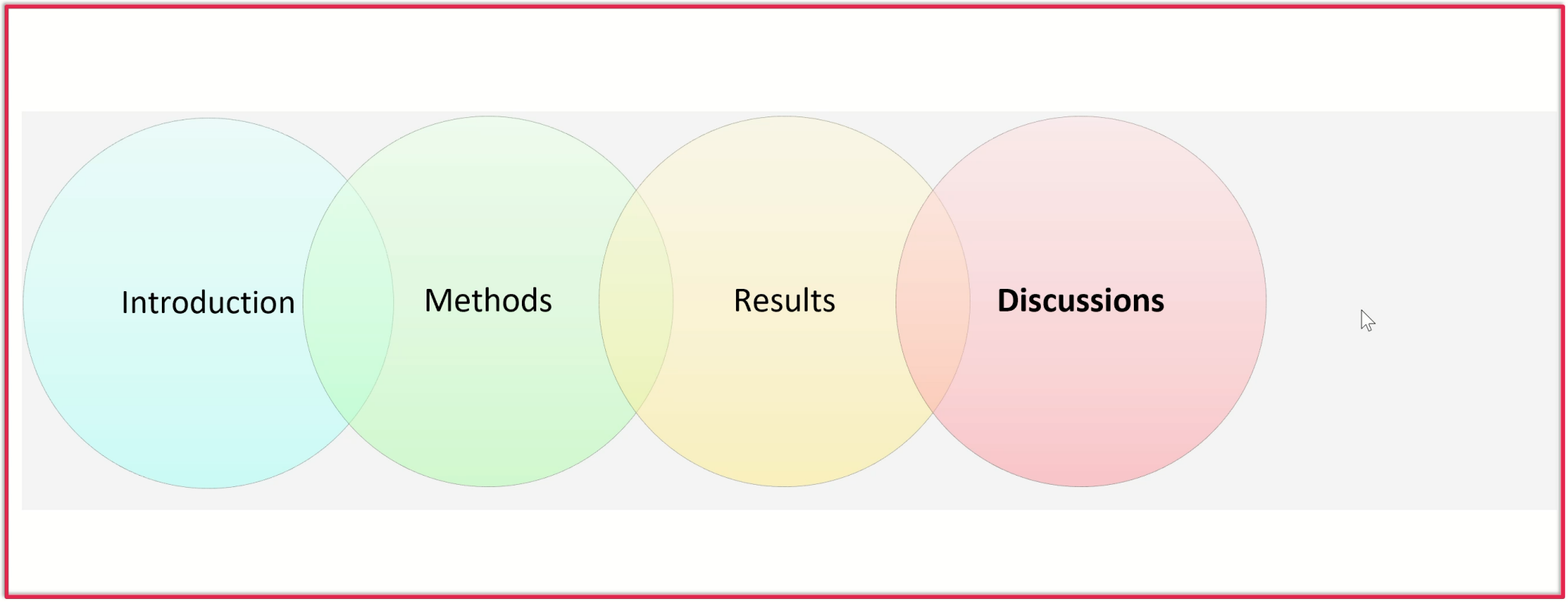
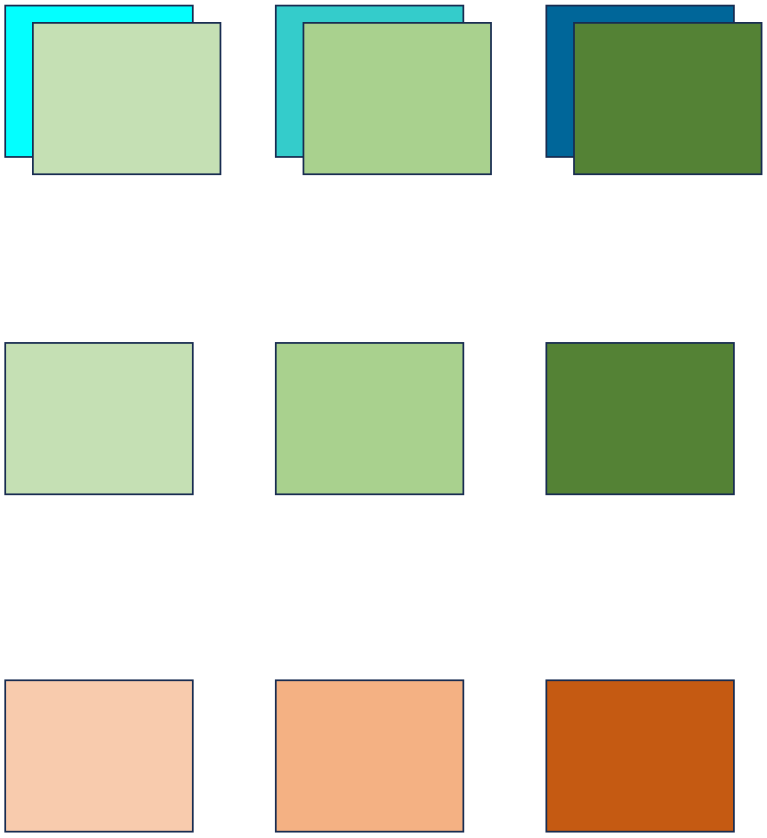
Section IV



Discussion

Content Yuehan Qu
Layout Yuehan Qu
Animation Yuehan Qu



Shade of Color

Graphic Encoding?

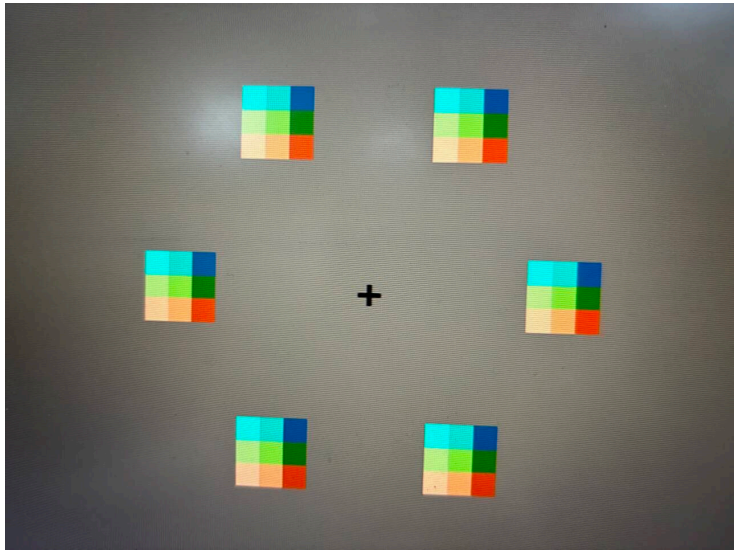
Discussion

Enhancement

Idea Junyan Luan & Siwei Luo
Content Siwei Luo
Edition & Layout Siwei Luo

HARD to Name

Name Encoding



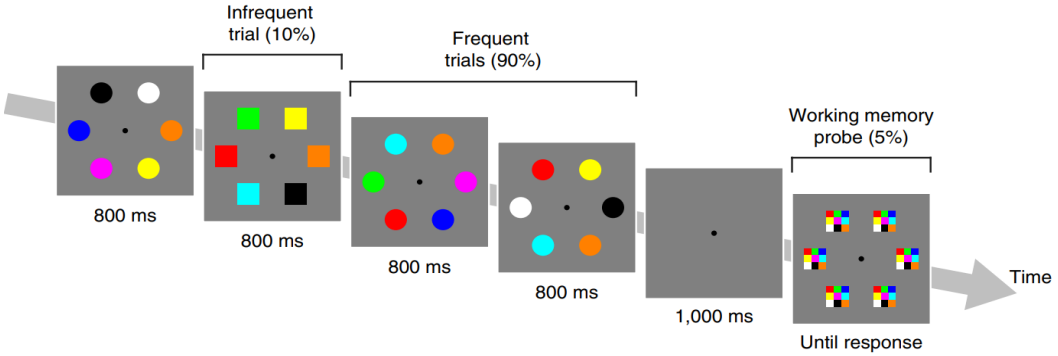
WM Task

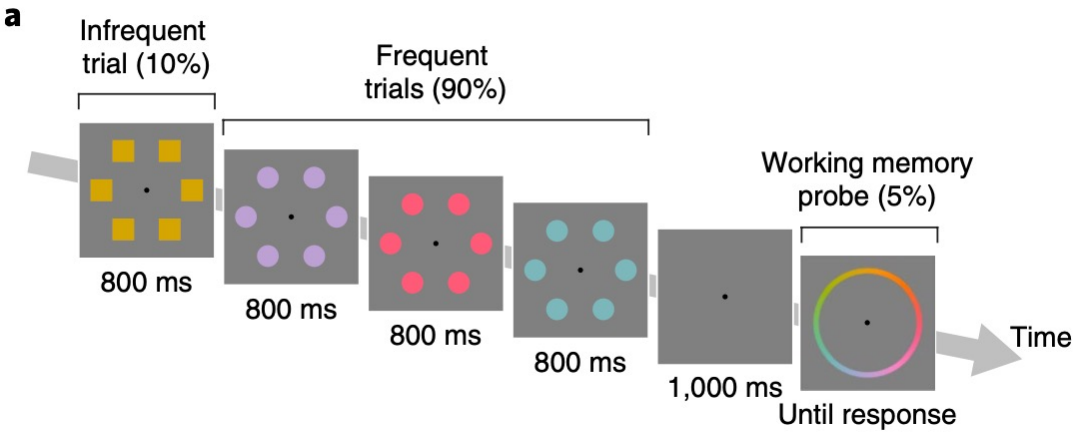
ORDERED

Discussion

WM Performance

Idea Siwei Luo
Content Siwei Luo
Edition & Layout Siwei Luo





Number of Colour

Precision of Colour

Discussion

Precision of Colour

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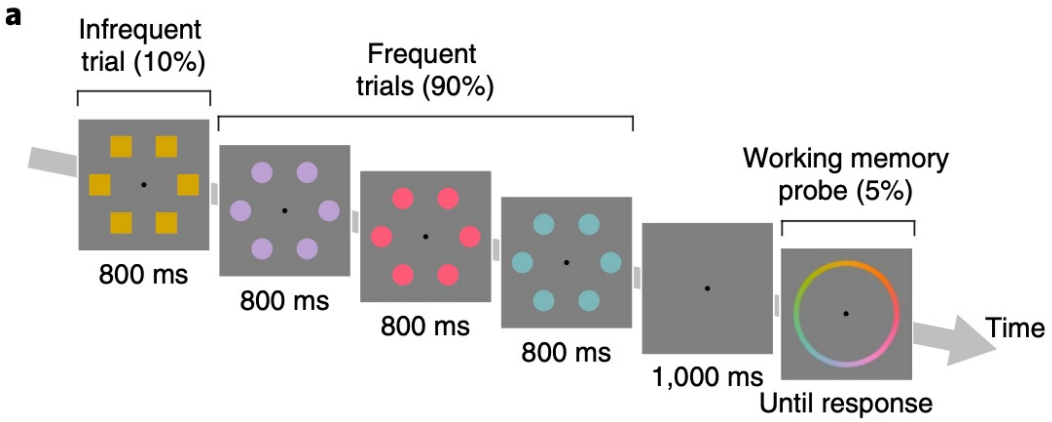
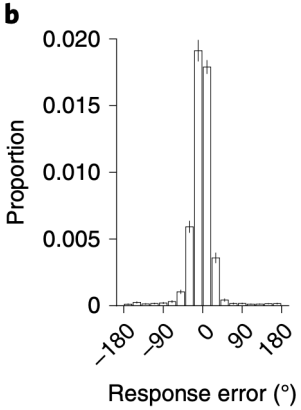
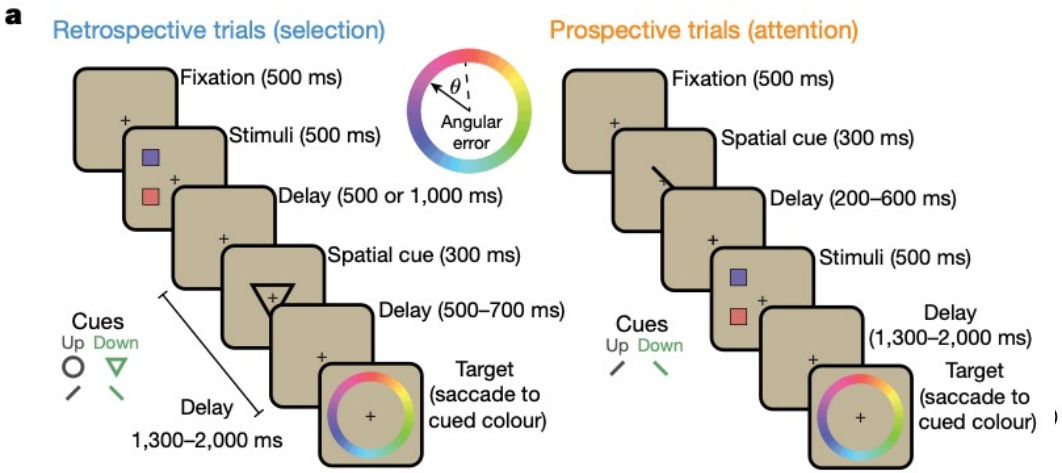
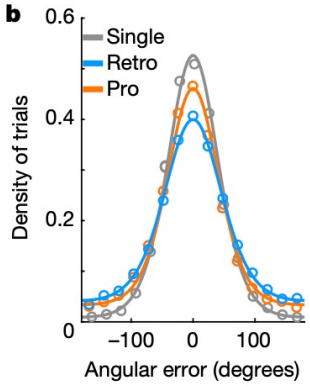
Content Siwei Luo
Edition & Layout Siwei Luo





Human





Monkey

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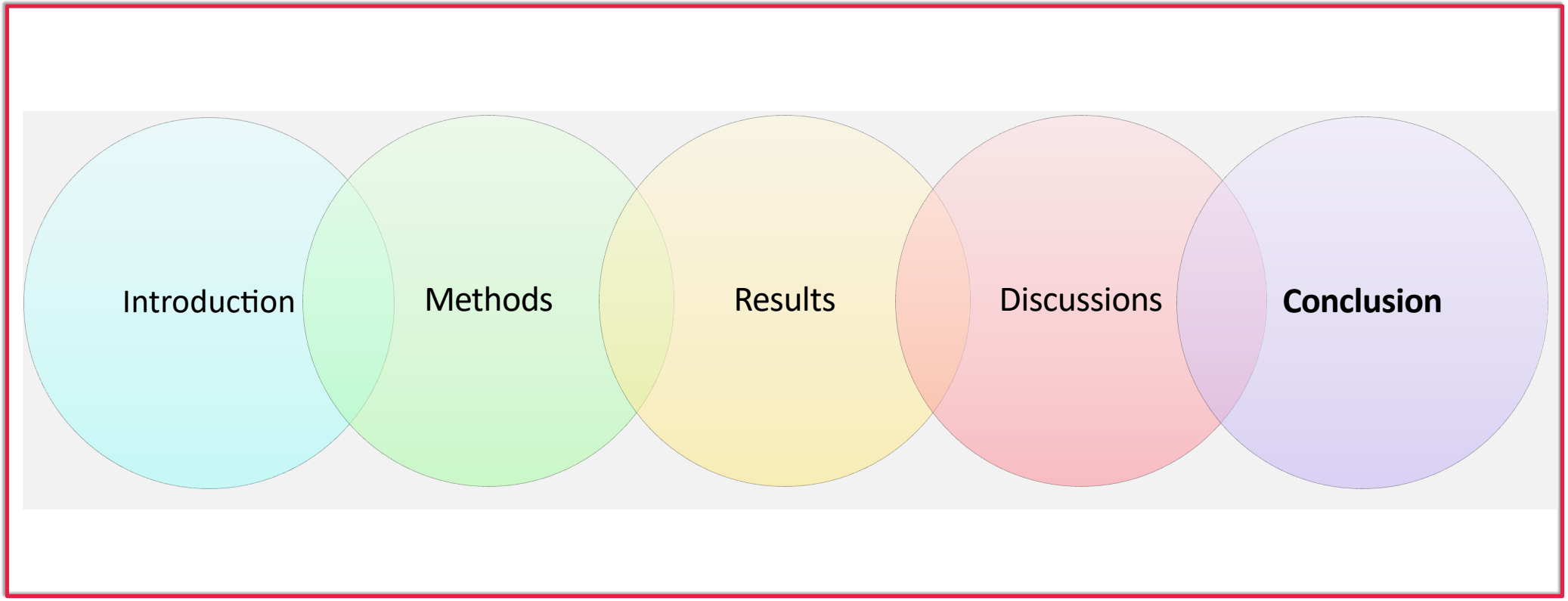
Section V



Main Discovery

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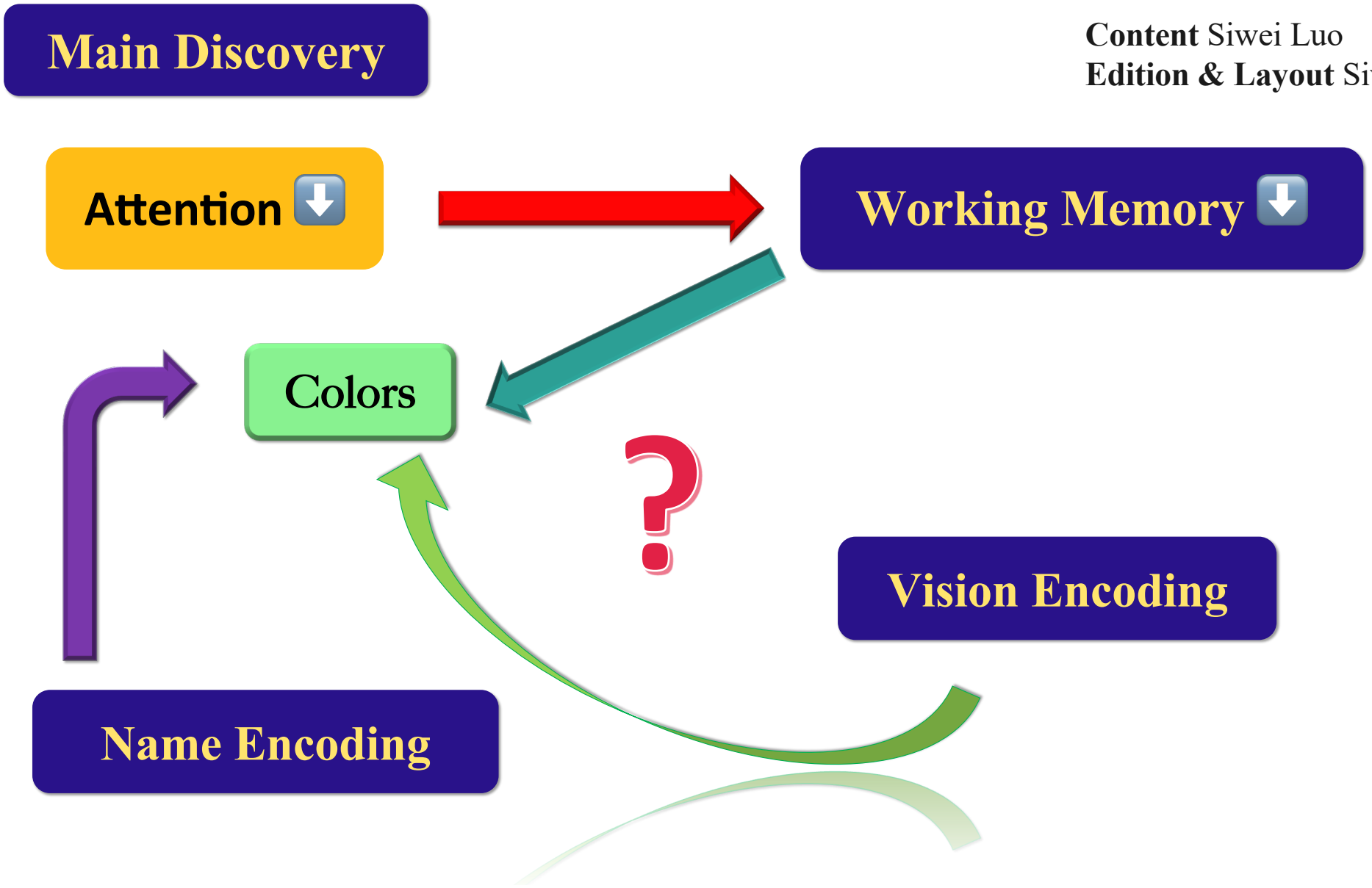
Edition & Layout Siwei Luo

Content Siwei Luo
Edition & Layout Siwei Luo



Main Discovery

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Edition & Layout Siwei Luo

Attention ⬇️

Working Memory ⬇️

Colors

Name Encoding

Vision Encoding

Main Discovery

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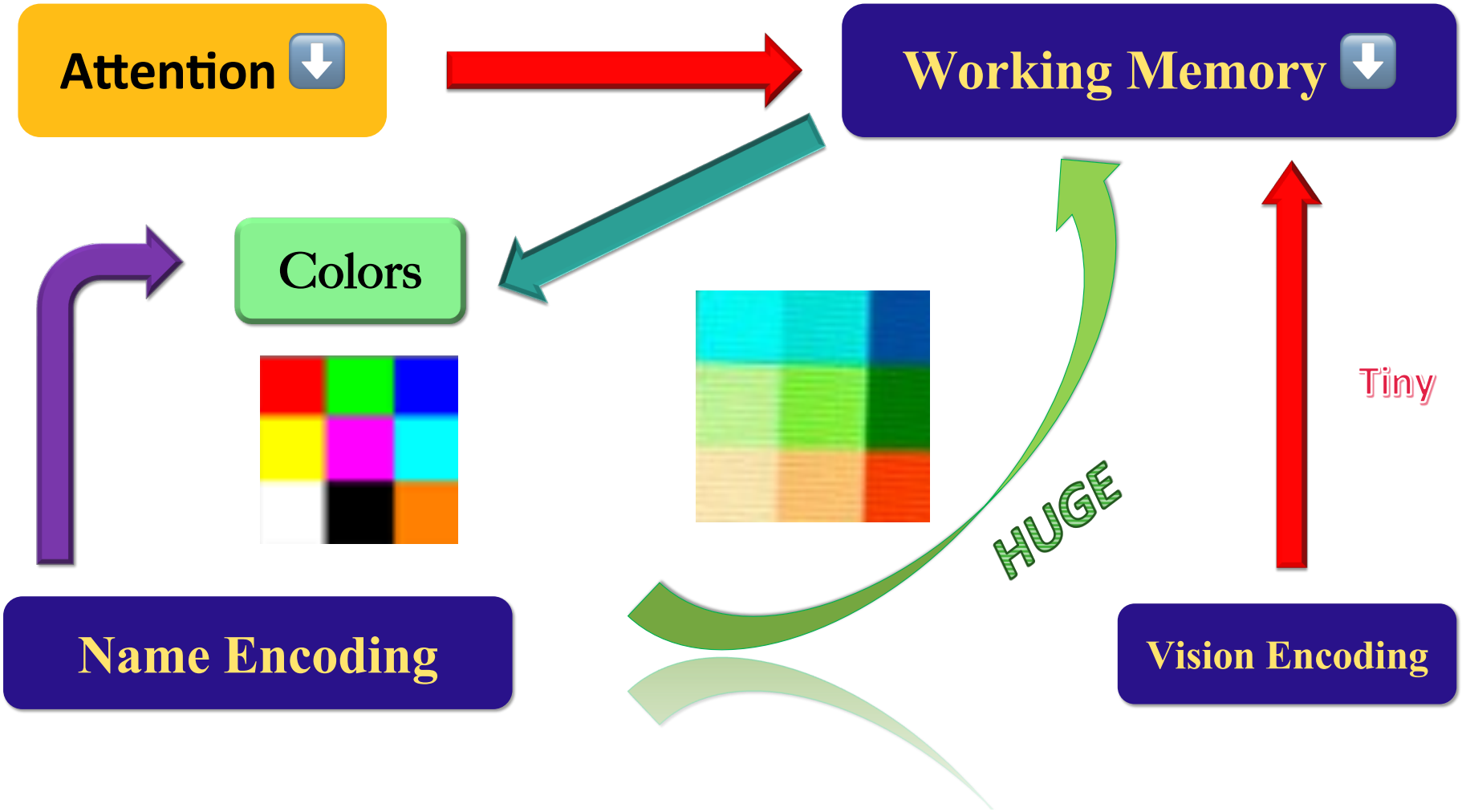

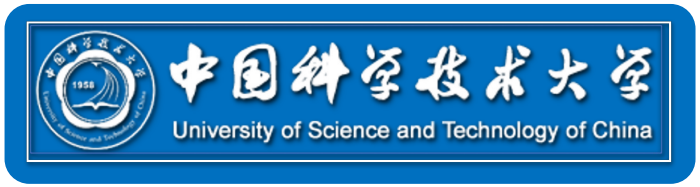

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Edition & Layout Siwei Luo

Thank you!

Siwei Luo; Junyan Luan; Guozun Sun; Yuehan Qu

23 May 2024

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