

EIGHTH EDITION

# COGNITIVE PSYCHOLOGY

A STUDENT'S HANDBOOK

MICHAEL W. EYSENCK  
& MARK T. KEANE

A Psychology Press Book



“This edition of Eysenck and Keane has further enhanced the status of *Cognitive Psychology: A Student’s Handbook*, as a high benchmark that other textbooks on this topic fail to achieve. It is informative and innovative, without losing any of its hallmark coverage and readability.”

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The fully updated eighth edition of *Cognitive Psychology: A Student's Handbook* provides comprehensive yet accessible coverage of all the key areas in the field ranging from visual perception and attention through to memory and language. Each chapter is complete with key definitions, practical real-life applications, chapter summaries and suggested further reading to help students develop an understanding of this fascinating but complex field.

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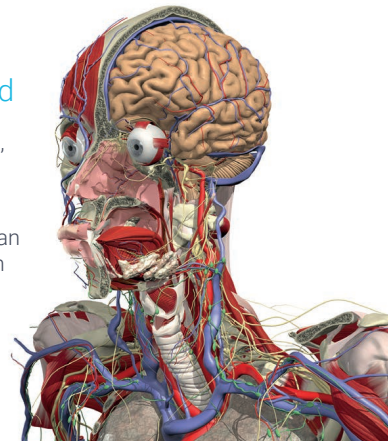
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# COGNITIVE PSYCHOLOGY

## A Student's Handbook

Eighth Edition

**MICHAEL W. EYSENCK  
AND MARK T. KEANE**

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*To Christine with love*  
(M.W.E.)

*What moves science forward is argument, debate,  
and the testing of alternative theories . . . A science without  
controversy is a science without progress.*  
(Jerry Coyne)





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# Contents

List of illustrations	xiv
Preface	xxix
Visual tour (how to use this book)	xxxix

## **1 Approaches to human cognition 1**

Introduction	1
Cognitive psychology	3
Cognitive neuropsychology	7
Cognitive neuroscience: the brain in action	12
Computational cognitive science	26
Comparisons of major approaches	33
Is there a replication crisis?	34
Outline of this book	36
Chapter summary	37
Further reading	39

## **PART I Visual perception and attention 41**

### **2 Basic processes in visual perception 43**

Introduction	43
Vision and the brain	44
Two visual systems: perception-action model	55
Colour vision	64
Depth perception	71
Perception without awareness: subliminal perception	81
Chapter summary	90
Further reading	92

### **3 Object and face recognition 94**

Introduction	94
Pattern recognition	95
Perceptual organisation	96

---

Approaches to object recognition	103
Object recognition: top-down processes	111
Face recognition	116
Visual imagery	130
Chapter summary	137
Further reading	139
<b>4 Motion perception and action</b>	<b>140</b>
Introduction	140
Direct perception	141
Visually guided movement	145
Visually guided action: contemporary approaches	152
Perception of human motion	157
Change blindness	163
Chapter summary	175
Further reading	176
<b>5 Attention and performance</b>	<b>178</b>
Introduction	178
Focused auditory attention	179
Focused visual attention	183
Disorders of visual attention	196
Visual search	200
Cross-modal effects	208
Divided attention: dual-task performance	212
“Automatic” processing	226
Chapter summary	231
Further reading	233
<b>PART II</b>	
<b>Memory</b>	<b>237</b>
<b>6 Learning, memory and forgetting</b>	<b>239</b>
Introduction	239
Short-term vs long-term memory	240
Working memory: Baddeley and Hitch	246
Working memory: individual differences and executive functions	254
Levels of processing (and beyond)	262
Learning through retrieval	265
Implicit learning	269
Forgetting from long-term memory	278
Chapter summary	293
Further reading	295

---

<b>7 Long-term memory systems</b>	<b>296</b>
Introduction	296
Declarative memory	300
Episodic memory	305
Semantic memory	313
Non-declarative memory	325
Beyond memory systems and declarative vs non-declarative memory	332
Chapter summary	340
Further reading	342
<b>8 Everyday memory</b>	<b>344</b>
Introduction	344
Autobiographical memory: introduction	346
Memories across the lifetime	351
Theoretical approaches to autobiographical memory	355
Eyewitness testimony	363
Enhancing eyewitness memory	372
Prospective memory	375
Theoretical perspectives on prospective memory	381
Chapter summary	389
Further reading	391
<b>PART III</b>	
<b>Language</b>	<b>393</b>
<b>9 Speech perception and reading</b>	<b>403</b>
Introduction	403
Speech (and music) perception	404
Listening to speech	408
Context effects	412
Theories of speech perception	417
Cognitive neuropsychology	429
Reading: introduction	432
Word recognition	436
Reading aloud	442
Reading: eye-movement research	453
Chapter summary	457
Further reading	460
<b>10 Language comprehension</b>	<b>461</b>
Introduction	461
Parsing: overview	462
Theoretical approaches: parsing and prediction	464
Pragmatics	478

Individual differences: working memory capacity	487
Discourse processing: inferences	490
Discourse comprehension: theoretical approaches	498
Chapter summary	510
Further reading	512

## **11 Language production** **514**

Introduction	514
Basic aspects of speech production	516
Speech planning	519
Speech errors	521
Theories of speech production	525
Cognitive neuropsychology: speech production	536
Speech as communication	543
Writing: the main processes	549
Spelling	558
Chapter summary	564
Further reading	566

## **PART IV**

### **Thinking and reasoning** **569**

## **12 Problem solving and expertise** **573**

Introduction	573
Problem solving: introduction	574
Gestalt approach and beyond: insight and role of experience	576
Problem-solving strategies	588
Analogical problem solving and reasoning	593
Expertise	600
Chess-playing expertise	601
Medical expertise	604
Brain plasticity	609
Deliberate practice and beyond	612
Chapter summary	619
Further reading	621

## **13 Judgement and decision-making** **622**

Introduction	622
Judgement research	623
Theories of judgement	633
Decision-making under risk	640
Decision-making: emotional and social factors	649
Applied and complex decision-making	654
Chapter summary	663
Further reading	665

---

<b>14 Reasoning and hypothesis testing</b>	<b>666</b>
Introduction	666
Hypothesis testing	667
Deductive reasoning	672
Theories of “deductive” reasoning	680
Brain systems in reasoning	690
Informal reasoning	694
Are humans rational?	701
Chapter summary	708
Further reading	710
<b>PART V</b>	
<b>Broadening horizons</b>	<b>713</b>
<b>15 Cognition and emotion</b>	<b>715</b>
Introduction	715
Appraisal theories	719
Emotion regulation	723
Affect and cognition: attention and memory	730
Affect and cognition: judgement and decision-making	738
Judgement and decision-making: theoretical approaches	750
Anxiety, depression and cognitive biases	753
Cognitive bias modification and beyond	761
Chapter summary	764
Further reading	766
<b>16 Consciousness</b>	<b>767</b>
Introduction	767
Functions of consciousness	768
Assessing consciousness and conscious experience	775
Global workspace and global neuronal workspace theories	783
Is consciousness unitary?	792
Chapter summary	798
Further reading	799
Glossary	801
References	824
Author index	915
Subject index	931

# Illustrations

## TABLES

1.1	Approaches to human cognition	3
1.2	Major techniques used to study the brain	16
1.3	Strengths and limitations of major approaches to human cognition	35
11.1	Involvement of working memory components in various writing processes	556
15.1	Effects of anxiety and depression on attentional bias (engagement and disengagement)	757

## PHOTOS

Chapter 1		
•	Max Coltheart	8
•	The magnetic resonance imaging (MRI) scanner	18
•	Transcranial magnetic stimulation coil	21
•	The IBM Watson and two human contestants (Ken Jennings and Brad Rutter)	27
Chapter 3		
•	Irving Biederman	107
•	Heather Sellers	118
Chapter 6		
•	Alan Baddeley and Graham Hitch	246
•	Endel Tulving	287
Chapter 7		
•	Henry Molaison	297
Chapter 8		
•	Jill Price	348
•	World Trade Center attacks on 9/11	349
•	Jennifer Thompson and Ronald Cotton	364

Chapter 11		
• Iris Murdoch		550
Chapter 12		
• Monty Hall		575
• Fernand Gobet		602
• Magnus Carlsen		613
Chapter 13		
• Pat Croskerry		625
• Nik Wallenda		647

## FIGURES

1.1	An early version of the information processing approach	4
1.2	Diagram to demonstrate top-down processing	4
1.3	Test yourself by naming the colours in each column	5
1.4	The four lobes, or divisions, of the cerebral cortex in the left hemisphere	13
1.5	Brodmann brain areas on the lateral and medial surfaces	13
1.6	The brain network and cost efficiency	14
1.7	The organisation of the “rich club”	15
1.8	The spatial and temporal resolution of major techniques and methods used to study brain functioning	17
1.9	Areas showing greater activation in a dead salmon when presented with photographs of people than when at rest	25
1.10	The primitive mock neuroimaging device used by Ali et al. (2014)	26
1.11	Architecture of a basic three-layer connectionist network	28
1.12	The main modules of the ACT-R cognitive architecture with their locations within the brain	30
1.13	The basic structure of the standard model of the mind involving five independent modules	31
2.1	Complex scene that requires prolonged perceptual processing to understand fully	43
2.2	Route of visual signals	45
2.3	Simultaneous contrast involving lateral inhibition	46
2.4	Some distinctive features of the largest visual cortical areas	47
2.5	Connectivity within the ventral pathway on the lateral surface of the macaque brain	48
2.6	(a) The single hierarchical model; (b) the parallel hierarchical model; (c) the three parallel hierarchical feedforward systems model	49
2.7	The percentage of cells in six different visual cortical areas responding selectively to orientation, direction of motion, disparity and colour	52
2.8	Visual motion inputs	53
2.9	Goodale and Milner’s (1992) perception-action model showing the dorsal and ventral streams	56
2.10	Lesion overlap in patients with optic ataxia	57



2.11	The Müller-Lyer illusion	58
2.12	The Ebbinghaus illusion	59
2.13	The hollow-face illusion. Left: normal and hollow faces with small target magnets on the forehead and cheek of the normal face; right: front view of the hollow mask that appears as an illusory face projecting forwards	60
2.14	Disruption of size judgements when estimated perceptually (estimation) or produced by grasping (grasping) in full or restricted vision	61
2.15	Historical developments in theories linking perception and action	63
2.16	Schematic diagram of the early stages of neural colour processing	66
2.17	Photograph of a mug showing enormous variation in the properties of the reflected light across the mug's surface	67
2.18	"The Dress" made famous by its appearance on the internet	69
2.19	Observers' perceptions of "The Dress"	69
2.20	An engraving by de Vries (1604/1970) in which linear perspective creates an effective three-dimensional effect when viewed from very close but not from further away	72
2.21	Examples of texture gradients that can be perceived as surfaces receding into the distance	73
2.22	Kanizsa's (1976) illusory square	73
2.23	Accuracy of size judgements as a function of object type	78
2.24	(a) A representation of the Ames room; (b) an actual Ames room showing the effect achieved with two adults	79
2.25	Perceived distance. Top: stimuli presented to participants; bottom: example of the stimulus display	81
2.26	The body size effect: what participants in the doll experiment could see	81
2.27	Estimated contributions of conscious and subconscious processing to GY's performance in exclusion and inclusion conditions in his normal and blind fields	84
2.28	The areas of most relevance to blindsight are the lateral geniculate nucleus and middle temporal visual area	86
2.29	The relationship between response bias in reporting conscious awareness and enhanced N200 on no-awareness correct trials compared to no-awareness incorrect trials (UC)	89
3.1	The kind of stimulus used by Navon (1977) to demonstrate the importance of global features in perception	95
3.2	The CAPTCHA used by Yahoo	97
3.3	The FBI's mistaken identification of the Madrid bomber	98
3.4	Examples of the Gestalt laws of perceptual organisation: (a) the law of proximity; (b) the law of similarity; (c) the law of good continuation; and (d) the law of closure	99
3.5	An ambiguous drawing that can be seen as either two faces or as a goblet	100
3.6	The tendency to perceive an array of empty circles as (A) a rotated square or (B) a diamond	101
3.7	A task to decide which region in each stimulus is the figure	102

---

3.8	High and low spatial frequency versions of a place (a building)	104
3.9	Image of <i>Mona Lisa</i> revealing very low spatial frequencies (left), low spatial frequencies (centre) and high spatial frequencies (right)	105
3.10	An outline of Biederman's recognition-by-components theory	107
3.11	Ambiguous figures	112
3.12	A brick wall that can be seen as something else	114
3.13	Object recognition involving two different routes: (1) a top-down route in which information proceeds rapidly to the orbitofrontal cortex; (2) a bottom-up route using the slower ventral visual stream	115
3.14	Interactive-iterative framework for object recognition	115
3.15	Recognising an elephant when a key feature (its trunk) is partially hidden	116
3.16	Accuracy and speed of object recognition for birds, boats, cars, chairs and faces by patient GG and healthy controls	120
3.17	Face-selective areas in the right hemisphere	121
3.18	An array of 40 faces to be matched for identity	124
3.19	The model of face recognition put forward by Bruce and Young (1986)	126
3.20	Damage to regions of the inferior occipito-temporal cortex, the anterior inferior temporal cortex and the anterior temporal pole	127
3.21	The approximate locations of the visual buffer in BA17 and BA18, of long-term memories of shapes in the inferior temporal lobe, and of spatial representations in the posterior parietal cortex	132
3.22	Dwell time for the four quadrants of a picture during perception and imagery	133
3.23	Slezak's (1991, 1995) investigations into the effects of rotation on object recognition	134
3.24	The extent to which perceived or imagined objects could be classified accurately on the basis of brain activity in the early visual cortex and object-selective cortex	135
3.25	Connectivity during perception and imagery involving (a) bottom-up processing; and (b) top-down processing	135
4.1	The optic-flow field as a pilot comes in to land, with the focus of expansion in the middle	142
4.2	Graspable and non-graspable objects having similar asymmetrical features	143
4.3	The visual features of a road viewed in perspective	147
4.4	The far road "triangle" in (A) a left turn and (B) a right turn	148
4.5	Errors in time-to-contact judgements for the smaller and the larger object as a function of whether they were presented in their standard size, the reverse size (off-size) or lacking texture (no-texture)	150
4.6	The dorso-dorsal and ventro-dorsal streams showing their brain locations and forms of processing	156

---

4.7	Point-light sequences (a) with the walker visible and (b) with the walker not visible	157
4.8	Human detection and discrimination efficiency for human walkers presented in contour, point lights, silhouette and skeleton	158
4.9	Brain areas involved in biological motion processing	159
4.10	The main brain areas associated with the mirror neuron system plus their interconnections	161
4.11	The unicycling clown who cycled close to students walking across a large square	164
4.12	The sequence of events in the disappearing lighter trick	166
4.13	Participants' fixation points at the time of dropping the lighter	166
4.14	Change blindness: an example	168
4.15	(a) Percentage of correct change detection as a function of form of change and time of fixation; also false alarm rate when there was no change. (b) Mean percentage correct change detection as a function of the number of fixations between target fixation and change of target and form of change	169
4.16	(a) Change-detection accuracy as a function of task difficulty and visual eccentricity. (b) The eccentricity at which change-detection accuracy was 85% correct as a function of task difficulty	170
4.17	An example of inattention blindness: a woman in a gorilla suit in the middle of a game of passing the ball	172
4.18	An example of inattention blindness: the sequence of events on the initial baseline trials and the critical trial	174
5.1	A comparison of Broadbent's theory, Treisman's theory, and Deutsch and Deutsch's theory	181
5.2	Split attention. (a) Shaded areas indicate the cued locations; the near and far locations are not cued. (b) Probability of target detection at valid (left or right) and invalid (near or far) locations	185
5.3	A comparison of object-based and space-based attention	187
5.4	Object-based and space-based attention. (a) Possible target locations for a given cue. (b) Performance accuracy at the various target locations	188
5.5	Sample displays for three low perceptual load conditions in which the task required deciding whether a target X or N was presented	190
5.6	The brain areas associated with the dorsal or goal-directed attention network and the ventral or stimulus-driven network	193
5.7	A theoretical approach based on several functional networks of relevance to attention: fronto-parietal; default mode; cingulo-opercular; and ventral attention	195
5.8	An example of object-centred or allocentric neglect	197
5.9	Illegal and dangerous items captured by an airport security screener	201
5.10	Frequency of selection and identification errors when targets were present at trials	201

5.11	Performance speed on a detection task as a function of target definition (conjunctive vs single feature) and display size	203
5.12	Eye fixations made by observers searching for pedestrians	204
5.13	A two-pathway model of visual search	205
5.14	An example of a visual search task when considering feature integration theory	208
5.15	An example of temporal ventriloquism in which the apparent time of onset of a flash is shifted towards that of a sound presented at a slightly different timing from the flash	210
5.16	Wickens's four-dimensional multiple-resource model	216
5.17	Threaded cognition theory	218
5.18	Patterns of brain activation: (a) underadditive activation; (b) additive activation; (c) overadditive activation	220
5.19	Effects of an audio distraction task on brain activity associated with a straight driving task	221
5.20	Dual-task (auditory <i>and</i> visual tasks) and single-task (auditory <i>or</i> visual task) conditions: reaction times for correct responses only over eight experimental sessions	224
5.21	Response times on a decision task as a function of memory-set size, display-set size and consistent vs varied mapping	227
5.22	Factors that are hypothesised to influence representational quality within Moors' (2016) theoretical approach	229
6.1	The multi-store model of memory as proposed by Atkinson and Shiffrin (1968)	240
6.2	Short-term memory performance in conditions designed to create interference (repeated condition) or minimise interference (unique condition)	243
6.3	The working memory model showing the connections among its four components and their relationship to long-term memory	246
6.4	Phonological loop system as envisaged by Baddeley (1990)	248
6.5	Sites where direct electrical stimulation disrupted digit-span performance	249
6.6	Amount of interference on a spatial task and a visual task as a function of a secondary task (spatial: movement vs visual: colour discrimination)	250
6.7	Screen displays for the digit 6	253
6.8	Mean reaction times quintile-by-quintile on the anti-saccade task by groups high and low in working memory capacity	256
6.9	Schematic representation of the unity and diversity of three executive functions	259
6.10	Activated brain regions across all executive functions in a meta-analysis of 193 studies	260
6.11	Recognition memory performance as a function of processing depth (shallow vs deep) for three types of stimuli: doors, clocks, and menus	263
6.12	Distinctiveness. Percentage recall of the critical item (e.g., kiwi) and of the preceding and following items in the encoding, retrieval and control conditions	264

6.13	(a) Restudy causes strengthening of the memory trace formed after initial study; (b) testing with feedback causes strengthening of the memory trace; and (c) the formation of a second memory trace	266
6.14	(a) Final recall for restudy-only and test-restudy group participants; (b) recall performance in the CMR group as a function of whether the mediators were or were not retrieved	267
6.15	Mean recall percentage in Session 2 on Test 1 and Test 2 as function of retrieval practice or restudy practice in Session 1	268
6.16	Schematic representation of a traditional keyboard	270
6.17	Mean number of completions in inclusion and exclusion conditions as a function of number of trials	273
6.18	Response times for participants showing a sudden drop in reaction times or not showing such a drop	273
6.19	The striatum is of central importance in implicit learning	274
6.20	A model of motor sequence learning	275
6.21	Sequential motor skill learning dependencies	276
6.22	Skilled typists' performance when tested on a traditional keyboard	277
6.23	Forgetting over time as indexed by reduced savings	279
6.24	Methods of testing for proactive and retroactive interference	281
6.25	Percentage of items recalled over time for the conditions: no proactive interference, remember and forget	282
6.26	Percentage of words correctly recalled across 32 articles in the respond, baseline and suppress conditions	286
6.27	Proportion of words recalled in high- and low-overload conditions with intra-list cues, strong extra-list cues and weak extra-list cues	289
7.1	Damage to brain areas within and close to the medial temporal lobes producing amnesia	298
7.2	The standard account based on dividing long-term memory into two broad classes: declarative and non-declarative	300
7.3	Interactions between episodic memories, semantic memories and gist memories	305
7.4	(a) Locations of the hippocampus, the perirhinal cortex and the parahippocampal cortex; (b) the binding-of-item-and-context model	307
7.5	(A) Left lateral, (B), medial and (C) anterior views of prefrontal areas having greater activation to familiarity-based than recollection-based processes and areas showing the opposite pattern	309
7.6	Sample pictures on the recognition-memory test	309
7.7	(A) Areas activated for both episodic simulation and episodic memory; (B) areas more activated for episodic simulation than episodic memory	312
7.8	Accuracy of (a) object categorisation and (b) speed of categorisation at the superordinate, basic and subordinate levels	315
7.9	The hub-and-spoke model	319

7.10	Performance accuracy on tool function and tool manipulation tasks with anodal transcranial direct current stimulation to the anterior temporal lobe or to the inferior parietal lobule and in a control condition	321
7.11	Categorisation performance for pictures and words by healthy controls and patients with semantic dementia	324
7.12	Percentages of priming effect and recognition-memory performance of healthy controls and patients	326
7.13	Brain regions showing repetition suppression or response enhancement in a meta-analysis	328
7.14	Mean reaction times on the serial reaction time task by Parkinson's disease patients and healthy controls	330
7.15	A processing-based memory model	334
7.16	Recognition memory for faces presented and tested in a fixed or variable viewpoint	335
7.17	Brain areas whose activity during episodic learning predicted increased recognition-memory performance (task-positive) or decreased performance (task-negative)	337
7.18	A three-dimensional model of memory: (1) conceptually or perceptually driven; (2) relational or item stimulus representation; (3) controlled or automatic/involuntary intention	339
7.19	Process-specific alliances including the left angular gyrus are involved in recollection of episodic memories and semantic processing	339
8.1	Brain regions activated by autobiographical, episodic retrieval and mentalising tasks including regions of overlap	347
8.2	Number of internal details specific to an autobiographical event recalled at various time delays (by controls and individuals with highly superior autobiographical memory)	348
8.3	Childhood amnesia based on data reported by Rubin and Schulkind (1997)	352
8.4	Temporal distribution of autobiographical memories across the lifespan	354
8.5	The knowledge structures within autobiographical memory, as proposed by Conway (2005)	357
8.6	The mean number of events participants could remember from the past 5 days and those they imagined were likely over the next 5 days	358
8.7	A model of the bidirectional relationships between neural networks involved in the construction and/or elaboration of autobiographical memories	360
8.8	Life structure scores (proportion negative, compartmentalisation, positive redundancy, negative redundancy) for patients with major depressive disorder, patients in remission from major depressive disorder and healthy controls	361
8.9	Four cognitive biases related to autobiographical memory recall that maintain depression and increase the risk of recurrence following remission	362

---

8.10	Examples of Egyptian and UK face-matching arrays	366
8.11	Size of the misinformation effect as a function of detail memorability in the neutral condition	367
8.12	Extent of misinformation effects as a function of condition for the original memory and endorsement of the misinformation presented previously	371
8.13	Eyewitness identification: test of face-recognition performance	371
8.14	A model of the component processes involved in prospective memory	378
8.15	Mean failures to resume an interrupted task and mean resumption times for the conditions: no-interruption, blank-screen interruption and secondary air traffic control task interruption	379
8.16	Self-reported memory vividness, memory details and confidence in memory for individuals with good and poor inhibitory control before and after repeated checking	381
8.17	The dual-pathways model of prospective memory (based on the multi-process framework) for non-focal and focal tasks separately	383
8.18	Example 1: top-down monitoring processes operating in isolation. Example 2: bottom-up spontaneous retrieval processes operating in isolation. Example 3: dual processes operating dynamically	383
8.19	(a) Sustained and (b) transient activity in the (c) left anterior prefrontal cortex for non-focal and focal prospective memory tasks	385
8.20	Frequency of cue-driven monitoring following the presentation of semantically related or unrelated cues	386
8.21	Different ways the instruction to press Q for fruit words was encoded	388
9.1	(a) Areas activated during passive music listening and passive speech listening; (b) areas activated more by listening to music than speech or the opposite	406
9.2	The main processes involved in speech perception and comprehension	407
9.3	A hierarchical approach to speech segmentation involving three levels or tiers	410
9.4	A model of spoken-word comprehension	412
9.5	Gaze probability for critical objects over the first 1,000 ms since target word onset for target neutral, competitor neutral, competitor constraining and unrelated neutral conditions	414
9.6	Mean target duration required for target recognition for words and sounds presented in isolation or within a general sentence context	420
9.7	The basic TRACE model, showing how activation between the three levels (word, phoneme and feature) is influenced by bottom-up and top-down processing.	421

9.8	(a) Actual eye fixations on the object corresponding to a spoken word or related to it; (b) predicted eye fixations from the TRACE model	422
9.9	Mean reaction times for recognition of /t/ and /k/ phonemes in words and non-words	423
9.10	Fixation proportions to high-frequency target words during the first 1,000 ms after target onset	428
9.11	A sample display showing two nouns (“bench” and “rug”) and two verbs (“pray” and “run”).	428
9.12	Processing and repetition of spoken words according to the three-route framework	430
9.13	A general framework of the processes and structures involved in reading comprehension	433
9.14	Estimated reading ability over a 30-month period with initial testing at a mean age of 66 months for English, Spanish and Czech children	434
9.15	McClelland and Rumelhart’s (1981) interactive activation model of visual word recognition	437
9.16	The time course of inhibitory and facilitatory effects of priming	440
9.17	Basic architecture of the dual-route cascaded model	443
9.18	The three components of the triangle model and their associated neural regions: orthography, phonology and semantics	448
9.19	Mean naming latencies for high-frequency and low-frequency words that were irregular or regular and inconsistent	451
9.20	Key assumptions of the E-Z Reader model	455
10.1	Total sentence processing time as a function of sentence type	471
10.2	A model of language processing involving heuristic and algorithmic routes	473
10.3	Sentence reading times as a function of the way in which comprehension was assessed: detailed questions; superficial questions on all trials; or occasional superficial questions	474
10.4	The N400 responses to a critical word in correct and incorrect sentences	476
10.5	Response times for literally false, scrambled metaphor, and metaphor sentences in (a) written and (b) spoken conditions)	480
10.6	Mean reaction times to verify metaphor-relevant and metaphor-irrelevant properties	482
10.7	Mean proportion of statements rated comprehensible with a response deadline of 500 or 1600 ms: literal, forward metaphors, reversed metaphors and scrambled metaphors	483
10.8	Sample displays seen from the listener’s perspective	485
10.9	Proportion of fixation on four objects over time	486
10.10	A theoretical framework for reading comprehension involving interacting passive and reader-initiated processes	492



10.11	Reaction times to name colours when the word presented in colour was predictable from the preceding text compared to a control condition	496
10.12	The construction–integration model	502
10.13	Forgetting functions for situation, proposition and surface information over a 4-day period	503
10.14	The RI-Val model showing the effects on comprehension of resonance, integration and validation over time	506
11.1	Brain areas activated during speech comprehension and production	517
11.2	Correlations between aphasic patients' speech-production abilities and their ability to detect their own speech-production errors	524
11.3	Speech-production processes for picture naming, with median peak activation times	532
11.4	Speech-production processes: the timing of activation associated with different cognitive functions	534
11.5	Language-related regions and their connections in the left hemisphere	536
11.6	Semantic and syntactic errors made by: healthy controls and patients with no damage to the dorsal or ventral pathway, damage to the ventral pathway only, damage to the dorsal pathway only and damage to both pathways	540
11.7	A sample array with six different garments coloured blue or green	544
11.8	Architecture of the forward modelling approach to explaining audience design effects	546
11.9	Hayes' (2012) writing model: (1) control level; (2) writing process level; and (3) resource level	552
11.10	The frequency of three major writing processes (planning, translating and revising) across the three phases of writing	553
11.11	Kellogg's three-stage theory of the development of writing skill	554
11.12	Brain areas activated during handwriting tasks	559
11.13	The cognitive architectures for (a) reading and (b) spelling	560
11.14	Brain areas in the left hemisphere associated with reading, letter perception and writing	563
12.1	Explanation of the solution to the Monty Hall problem	575
12.2	Brain areas involved in (a) mathematical problem solving; (b) verbal problem solving; (c) visuo-spatial problem solving; and (d) areas common to all three problem types (conjunction)	577
12.3	The mutilated draughtboard problem	577
12.4	Flow chart of insight problem solving	580
12.5	(a) The nine-dot problem and (b) its solution	580
12.6	Two of the matchstick problems used by Knoblich et al. (1999) with cumulative solution rates	581
12.7	The multiplying billiard balls trick	582
12.8	The two-string problem	583
12.9	Some of the materials for participants instructed to mount a candle on a vertical wall in Duncker's (1945) study	585

12.10	Mean percentages of correct solutions as a function of problem type and working memory capacity	587
12.11	The initial state of the five-disc version of the Tower of Hanoi problem	588
12.12	Tower of London task (two-move and five-move problems)	590
12.13	A problem resembling those used on the Raven's Progressive Matrices	594
12.14	Relational reasoning: the probabilities of successful encoding, inferring, mapping and applying for lower and high performers	597
12.15	Major processes involved in performance of numerous cognitive tasks	598
12.16	Summary of key brain regions and their associated functions in relational reasoning based on patient and neuroimaging studies	599
12.17	Mean strength of the first-mentioned chess move and the move chosen as a function of problem difficulty by experts and by tournament players	603
12.18	A theoretical framework of the main cognitive processes and potential errors in medical decision-making	605
12.19	Eye fixations of a pathologist given the same biopsy whole-slide image (a) starting in year 1 and (d) ending in year 4	606
12.20	Brain activation while diagnosing lesions in X-rays, naming animals and naming letters	608
12.21	Brain image showing areas in the primary motor cortex with differences in relative voxel size between trained children and non-trained controls: (a) changes in relative voxel size over time; (b) correlation between improvement in motor-test performance and change in relative voxel size	611
12.22	Brain image showing areas in the primary auditory area with differences in relative voxel size between trained children and non-trained controls: (a) changes in relative voxel size over time; (b) correlation between improvement in a melody-rhythm test and change in relative voxel size	612
12.23	Mean chess ratings of candidates, non-candidate grandmasters and all non-grandmasters as a function of number of games played	616
12.24	The main factors (genetic and environmental) influencing the development of expertise	617
13.1	Percentages of correct responses and various incorrect responses with the false-positive and benign cyst scenarios	627
13.2	Percentage of correct predictions of the judged frequencies of different causes of death based on the affect heuristic (overall dread score), affect heuristic and availability	628
13.3	Percentage of correct inferences on four tasks	632
13.4	A hypothetical value function	642
13.5	Ratings of competence satisfaction for the sunk-cost option and the alternative option for those selecting each option	644

13.6	Risk aversion for gains and risk seeking for losses on a money-based task by financial professionals and students	645
13.7	Percentages of participants adhering to cumulative prospect theory, the minimax rule, or unclassified with affect-poor and affect-rich problems (a) with or (b) without numerical information concerning willingness to pay for medication	650
13.8	Proportion of politicians and population samples in Belgium, Canada and Israel voting to extend a loan programme	654
13.9	A model of selective exposure: defence motivation and accuracy motivation	659
13.10	The five phases of decision-making according to Galotti's theory	660
13.11	Klein's recognition-primed decision model	661
14.1	Mean number of <i>modus ponens</i> inferences accepted as a function of relative strength of the evidence and strategy	676
14.2	The Wason selection task	676
14.3	Percentage acceptance of conclusions as a function of perceived base rate (low vs high), believability of conclusions and validity of conclusions	679
14.4	Three models of the relationship between the intuitive and deliberate systems: (a) serial model; (b) parallel model; and (c) logical intuition model	685
14.5	Proportion correct on incongruent syllogisms as a function of instructions and cognitive ability	687
14.6	The approximate time courses of reasoning and meta-reasoning processes during reasoning and problem solving	689
14.7	Brain regions most consistently activated across 28 studies of deductive reasoning	690
14.8	Relationships between reasoning task performance (accuracy) and inferior frontal cortex activity in the left hemisphere and the right hemisphere in (a) the low-load condition and (b) the high-load condition	692
14.9	Mean responses to the question, "How much risk do you believe climate change poses to human health, safety or prosperity?"	696
14.10	Effects of trustworthiness and others' opinions on convincingness ratings	700
14.11	Mean-rated argument strength as a function of the probability of the outcome and how negative the outcome would be	701
14.12	Stanovich's tripartite model of reasoning	706
15.1	The two-dimensional framework for emotion showing the two dimensions of pleasure–misery and arousal–sleep and the two dimensions of positive affect and negative affect	716
15.2	Brain areas activated by positive, negative and neutral stimuli	717
15.3	Brain areas showing greater activity for top-down than for bottom-up processing and those showing greater activity for bottom-up than for top-down processes	718
15.4	Multiple appraisal mechanisms used in emotion generation	720

15.5	Changes in self-reported horror and distress and in galvanic skin response between pre-training and post-training (for the watch condition and the appraisal condition)	721
15.6	A process model of emotion regulation based on five major types of strategy (situation selection, situation modification, attention deployment, cognitive change and response modulation)	725
15.7	Mean level of depression as a function of stress severity and cognitive reappraisal ability	727
15.8	A three-stage neural network model of emotion regulation	728
15.9	The incompatibility flanker effect (incompatible trials – compatible trials) on reaction times as a function of mood (happy or sad) and whether a global, local or mixed focus had been primed on a previous task	733
15.10	Two main brain mechanisms involved in the memory-enhancing effects of emotion: (1) the medial temporal lobes; (2) the medial, dorsolateral and ventrolateral prefrontal cortex	735
15.11	(a) Free and (b) cued recall as a function of mood state (happy or sad) at learning and at recall	737
15.12	Two well-known moral dilemma problems: (a) the trolley problem; and (b) the footbridge problem	738
15.13	The dorsolateral prefrontal cortex, located approximately in Brodmann areas 9 and 46 and the ventromedial prefrontal cortex located approximately in Brodmann areas 10 and 11	739
15.14	Sensitivity to consequences, sensitivity to moral norms and preference for inaction vs action as a function of psychopathy (low vs high)	741
15.15	Driverless cars: moral decisions	742
15.16	Effects of mood manipulation (anxiety, sadness or neutral) on percentages of people choosing a high-risk job option	745
15.17	Mean buying price for a water bottle as a function of mood (neutral vs sad) and self-focus (low vs high)	746
15.18	The positive emotion “family tree” with the trunk representing the neural reward system and the branches representing nine semi-distinct positive emotions	748
15.19	Probability of selecting a candy bar by participants in a happy or sad mood as a function of implicit attitudes on the Implicit Association Test	750
15.20	Effects of mood states on judgement and decision-making.	750
15.21	The emotion-imbued choice model	752
15.22	The dot-probe task	756
15.23	The emotional Stroop task	756
15.24	The impaired cognitive control account put forward by Joormann et al. (2007)	761
16.1	Mean scores for error detection on a proofreading task comparing unconscious goal vs no-goal control and low vs. high goal importance	770
16.2	Awareness as a social perceptual model of attention	771

---

16.3	(a) Region in left fronto-polar cortex for which decoding of upcoming motor decisions was possible. (b) Decoding accuracy of these decisions	774
16.4	Undistorted and distorted photographs of the Brunnen der Lebensfreude in Rostock, Germany	777
16.5	Modulation of the appropriate frequency bands of the EEG signal associated with motor imagery in one healthy control and three patients	779
16.6	Activation patterns on a binocular-rivalry task when observers (A) reported what they perceived or (B) passively experienced rivalry	781
16.7	Three successive stages of visual processing following stimulus presentation	782
16.8	Percentage of trials on which participants reported awareness of the content of photographs under masked and unmasked conditions for animal and non-animal photographs	783
16.9	Five hypotheses about the relationship between attention and conscious awareness identified by Webb and Graziano	785
16.10	Event-related potential waveforms in the aware-correct, unaware-correct and unaware-incorrect conditions	786
16.11	Synchronisation of neural activity across cortical areas for consciously perceived words (visible condition) and non-perceived words (invisible condition) during different time periods	787
16.12	Integrated brain activity: (a) overall information sharing or integration across the brain for vegetative state, minimally conscious and conscious brain-damaged patients and healthy controls); (b) information sharing (integration) across short, medium and long distances within the brain for the four groups	788
16.13	Event-related potentials in the left and right hemispheres to the first of two stimuli by AC (a patient with severe corpus callosum damage)	796
16.14	Detection and localisation of circles presented to the left or right visual fields by two patients responding verbally, with the left or right hand	797

# Preface

Producing regular editions of this textbook gives us a front-row seat from which to observe all the exciting developments in our understanding of human cognition. What are the main reasons for the rapid rate of progress within cognitive psychology since the seventh edition of this textbook? Below we identify two factors that have been especially important.

First, the overarching assumption that the optimal way to enhance our understanding of cognition is by combining data and insights from several different approaches remains exceptionally fruitful. These approaches include traditional cognitive psychology; cognitive neuropsychology (study of brain-damaged patients); computational cognitive science (development of computational models of human cognition); and cognitive neuroscience (combining information from behaviour and from brain activity). Note that we use the term “cognitive psychology” in a broad or general sense to cover *all* these approaches.

The above approaches all continue to make extremely valuable contributions. However, cognitive neuroscience deserves to be singled out – it has increasingly been used with great success to resolve theoretical controversies and to provide novel empirical data that foster theoretical developments.

Second, there has been a steady increase in cognitive research of direct relevance to real life. This is reflected in a substantial increase in the number of boxes labelled “IN THE REAL WORLD” in this edition compared to the previous one. Examples include eyewitness confidence, mishearing of song lyrics, multi-tasking, airport security checks and causes of plane crashes. What is noteworthy is the increased *quality* of real-world research (e.g., more sophisticated experimental designs; enhanced theoretical relevance).

With every successive edition of this textbook, the authors have had to work harder and harder to keep with huge increase in the number of research publications in cognitive psychology. For example, the first author wrote parts of the book in far-flung places including Botswana, New Zealand, Malaysia and Cambodia. His only regret is that book writing has sometimes had to take precedence over sightseeing!

We would both like to thank the very friendly and efficient staff at Psychology Press including Sadé Lee and Ceri McLardy.

We would also like to thank the anonymous reviewers, that commented on various chapters. Their comments were very useful when we embarked on the task of revising the first draft of the manuscript. Of course, we are responsible for any errors and/or misunderstandings that remain.

Michael Eysenck and Mark Keane

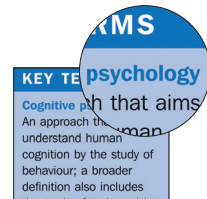
# Visual tour (how to use this book)

## TEXTBOOK FEATURES

Listed below are the various pedagogical features that can be found both in the margins and within the main text, with visual examples of the boxes to look out for, and descriptions of what you can expect them to contain.

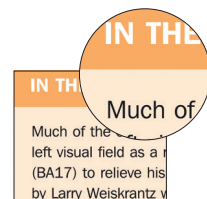
### Key terms

Throughout the book, key terms are highlighted in the text and defined in boxes in the margins, helping you to get to grips with the vocabulary fundamental to the subject being covered.



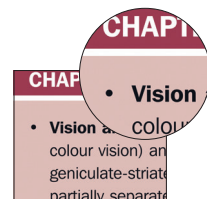
### In the real world

Each chapter contains boxes within the main text that explore “real world” examples, providing context and demonstrating how some of the theories and concepts covered in the chapter work in practice.



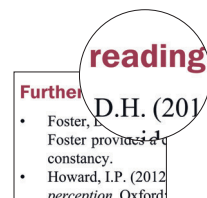
### Chapter summary

Each chapter concludes with a brief summary of each section of the chapter, helping you to consolidate your learning by making sure you have taken in all of the concepts covered.



### Further reading

Also at the end of each chapter is an annotated list of key scholarly books, book chapters, and journal articles that it is recommended you explore through independent study to expand upon the knowledge you have gained from the chapter and plan for your assignments.

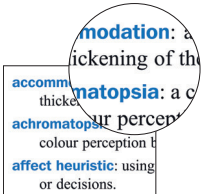






## Links to companion website features

Whenever you see this symbol, look out for related supplementary material amongst the resources for that chapter on the companion website at [www.routledge.com/cw/eyenck](http://www.routledge.com/cw/eyenck).



## Glossary

An extensive glossary appears at the end of the book, offering a comprehensive list that includes all the key terms boxes in the main text.

# Approaches to human cognition

## INTRODUCTION

We are now well into the third millennium and there is ever-increasing interest in unravelling the mysteries of the human brain and mind. This interest is reflected in the substantial upsurge of scientific research within cognitive psychology and cognitive neuroscience. In addition, the cognitive approach has become increasingly influential within clinical psychology. In that area, it is recognised that cognitive processes (especially cognitive biases) play a major role in the development (and successful treatment) of mental disorders (see Chapter 15).

In similar fashion, social psychologists increasingly focus on **social cognition**. This focuses on the role of cognitive processes in influencing individuals' behaviour in social situations. For example, suppose other people respond with laughter when you tell them a joke. This laughter is often ambiguous – they may be laughing with you or at you (Walsh et al., 2015). Your subsequent behaviour is likely to be influenced by your cognitive interpretation of their laughter.

What *is* cognitive psychology? It is concerned with the internal processes involved in making sense of the environment and deciding on appropriate action. These processes include attention, perception, learning, memory, language, problem solving, reasoning and thinking. We can define **cognitive psychology** as aiming to understand human cognition by observing the behaviour of people performing various cognitive tasks. However, the term “cognitive psychology” can also be used more broadly to include brain activity and structure as relevant information for understanding human cognition. It is in this broader sense that it is used in the title of this book.

Here is a simple example of cognitive psychology in action. Frederick (2005) developed a test (the Cognitive Reflection Test) that included the following item:

A bat and a ball cost \$1.10 in total. The bat costs \$1.00 more than the ball. How much does the ball cost? \_\_\_ cents

### KEY TERMS

#### **Social cognition**

An approach within social psychology in which the emphasis is on the cognitive processing of information about other people and social situations.

#### **Cognitive psychology**

An approach that aims to understand human cognition by the study of behaviour; a broader definition also includes the study of brain activity and structure.

**KEY TERM** **Cognitive neuroscience**

An approach that aims to understand human cognition by combining information from behaviour and the brain.

What do *you* think is the correct answer? Brañas-Garza et al. (2015) found in a review of findings from 41,004 individuals that 68% produced the wrong answer (typically 10 cents) and only 32% gave the right answer (5 cents). Even providing financial incentives to produce the correct answer failed to improve performance.

The above findings suggest most people will rapidly produce an incorrect answer (i.e., 10 cents) that is easily accessible and are unwilling to devote extra time to checking that they have the right answer. However, Gangemi et al. (2015) found many individuals producing the wrong answer had a feeling of error suggesting they experienced cognitive uneasiness about their answer. In sum, the intriguing findings on the Cognitive Reflection Test indicate that we can fail to think effectively even on relatively simple problems. Subsequent research has clarified the reasons for these deficiencies in our thinking (see Chapter 12).

The aims of cognitive neuroscientists overlap with those of cognitive psychologists. However, there is one major difference between cognitive neuroscience and cognitive psychology in the narrow sense. Cognitive neuroscientists argue convincingly we need to study the *brain* as well as behaviour while people engage in cognitive tasks. After all, the internal processes involved in human cognition occur in the brain. **Cognitive neuroscience** uses information about behaviour and the brain to understand human cognition. Thus, the distinction between cognitive neuroscience and cognitive psychology in the broader sense is blurred.

Cognitive neuroscientists explore human cognition in several ways. First, there are brain-imaging techniques of which functional magnetic resonance imaging (fMRI) is probably the best-known. Second, there are electrophysiological techniques involving the recording of electrical signals generated by the brain. Third, many cognitive neuroscientists study the effects of brain damage on cognition. It is assumed the patterns of cognitive impairment shown by brain-damaged patients can inform us about normal cognitive functioning and the brain areas responsible for various cognitive processes.

The huge increase in scientific interest in the workings of the brain is mirrored in the popular media – numerous books, films and television programmes communicate the more accessible and dramatic aspects of cognitive neuroscience. Increasingly, media coverage includes coloured pictures of the brain indicating the areas most activated when people perform various tasks.

## Four main approaches

We can identify four main approaches to human cognition (see Table 1.1). Note, however, there has been a substantial increase in research combining two (or even more) of these approaches. We will shortly discuss each approach in turn and you will probably find it useful to refer back to this chapter when reading the rest of the book. Hopefully, you will find Table 1.3 (towards the end of this chapter) especially useful because it summarises the strengths and limitation of all four approaches.

TABLE 1.1 APPROACHES TO HUMAN COGNITION

1. *Cognitive psychology*: this approach involves using behavioural evidence to enhance our understanding of human cognition. Since behavioural data are also of great importance within cognitive neuroscience and cognitive neuropsychology, cognitive psychology's influence is enormous.
2. *Cognitive neuropsychology*: this approach involves studying brain-damaged patients to understand normal human cognition. It was originally closely linked to cognitive psychology but has recently also become linked to cognitive neuroscience.
3. *Cognitive neuroscience*: this approach involves using evidence from behaviour and the brain to understand human cognition.
4. *Computational cognitive science*: this approach involves developing computational models to further our understanding of human cognition; such models increasingly incorporate knowledge of behaviour and the brain. A computational model takes the form of an **algorithm**, which consists of a precise and detailed specification of the steps involved in performing a task. Computational models are designed to simulate or imitate human processing on a given task.

**KEY TERM** **Algorithm**

A computational procedure providing a specified set of steps to problem solution; see **heuristic**.

## COGNITIVE PSYCHOLOGY

We can obtain some perspective on the contribution of cognitive psychology by considering what preceded it. Behaviourism was the dominant approach to psychology throughout the first half of the twentieth century. The American psychologist John Watson (1878–1958) is often regarded as the founder of behaviourism. He argued that psychologists should focus on stimuli (aspects of the immediate situation) and responses (behaviour produced by the participants in an experiment). This approach appears “scientific” because it focuses on stimuli and responses, both of which are observable.

Behaviourists argued that internal mental processes (e.g., attention) cannot be verified by reference to observable behaviour and so should be ignored. According to Watson (1913, p. 165), behaviourism should “never use the terms consciousness, mental states, mind, content, introspectively verifiable and the like”. In stark contrast, as we have already seen, cognitive psychologists argue it is of crucial importance to study such internal mental processes. Hopefully, you will be convinced that cognitive psychologists are correct when you read how the concepts of attention (Chapter 5) and consciousness (Chapter 16) have been used fruitfully to enhance our understanding of human cognition.

It is often claimed that behaviourism was overthrown by the “cognitive revolution”. However, the reality was less dramatic (Hobbs & Burman, 2009). For example, Tolman (1948) was a behaviourist but he did not believe internal processes should be ignored. He carried out studies in which rats learned to run through a maze to a goal box containing food. When Tolman blocked off the path the rats had learned to use, they rapidly learned to follow other paths leading in the right general direction. Tolman concluded the rats had acquired an internal *cognitive map* indicating the maze's approximate layout.

It is almost as pointless to ask “When did cognitive psychology start?”, as to enquire “How long is a piece of string?”. However, 1956 was crucially

## KEY TERMS

### Bottom-up processing

Processing directly influenced by environmental stimuli; see **top-down processing**.

### Serial processing

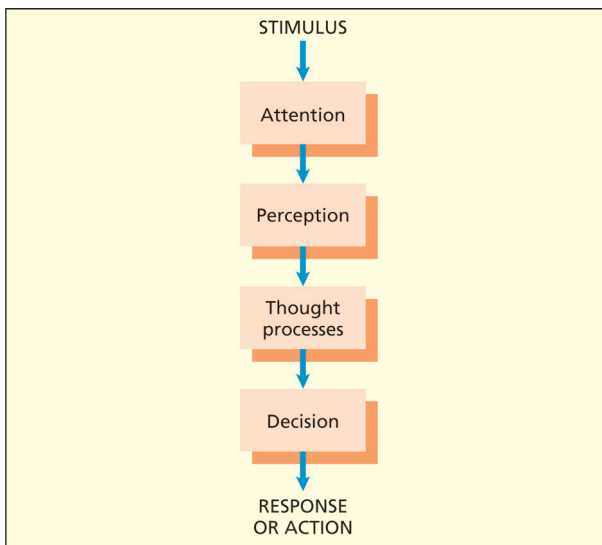
Processing in which one process is completed before the next one starts; see **parallel processing**.

### Top-down processing

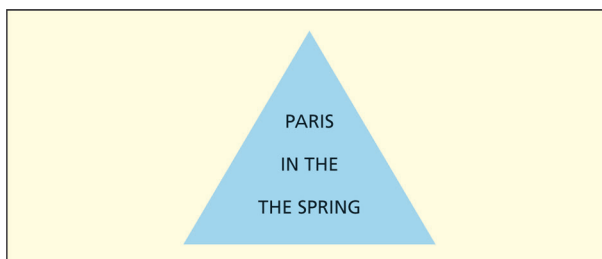
Stimulus processing that is influenced by factors such as the individual's past experience and expectations.

important. At a meeting at the Massachusetts Institute of Technology, Noam Chomsky presented his theory of language, George Miller discussed the magic number seven in short-term memory (Miller, 1956) and Alan Newell and Herbert Simon discussed the General Problem Solver (see Gobet and Lane, 2015). In addition, there was the first systematic attempt to study concept formation from the cognitive perspective (Bruner et al., 1956). The history of cognitive psychology from the perspective of its classic studies is discussed in Eysenck and Groomer (2015a).

Several decades ago, most cognitive psychologists subscribed to the information-processing approach based loosely on an analogy between the mind and the computer (see Figure 1.1). A stimulus (e.g., a problem or task) is presented, which causes various internal processes to occur, leading eventually to the desired response or answer. Processing directly affected by the stimulus input is often described as **bottom-up processing**. It was typically assumed only one process occurs at a time: this is **serial processing**, meaning the current process is completed before the onset of the next one.



**Figure 1.1**  
An early version of the information processing approach.



**Figure 1.2**  
Diagram to demonstrate top-down processing.

The above approach is drastically oversimplified. Task processing typically also involves **top-down processing**, which is processing influenced by the individual's expectations and knowledge rather than simply by the stimulus itself. Read what it says in the triangle (Figure 1.2). Unless you know the trick, you probably read it as "Paris in the spring". If so, look again: the word "the" is repeated. Your expectation it was a well-known phrase (i.e., top-down processing) dominated the information available from the stimulus (i.e., bottom-up processing).

The traditional approach was also oversimplified in assuming processing is typically serial. In fact, more than one process typically occurs at the same time – this is **parallel processing**. We are much more likely to use parallel processing when performing a highly practised task than a new one (see Chapter 5). For example, someone taking their first driving lesson finds it very hard to control the car's speed, steer accurately and pay attention to other road users at the same time. In contrast, an experienced driver finds it easy.

There is also **cascade processing**: a form of parallel processing involving an *overlap* of different processing stages when someone performs a task. More specifically, later stages of processing are initiated before one or more earlier stages have finished. For example, suppose you are trying to work out the meaning of a visually presented word.

The most thorough approach would involve identifying all the letters in the word followed by matching the resultant letter string against words you have stored in long-term memory. In fact, people often engage in cascade processing – they form hypotheses as to the word that has been presented *before* identifying all the letters (McClelland, 1979).

An important issue for cognitive psychologists is the task-impurity problem – most cognitive tasks require several processes thus making it hard to interpret the findings. One approach to this problem is to consider various tasks all requiring the same process. For example, Miyake et al. (2000) used three tasks requiring deliberate inhibition of a dominant response:

- (1) The Stroop task: name the colour in which colour words are presented (e.g., RED printed in green) and avoid saying the colour word (which has to be inhibited). You can see for yourself how hard this task is by naming the colours of the words shown in Figure 1.3.
- (2) The anti-cascade task: inhibit the natural tendency to look at a visual cue and instead look in the opposite direction. People typically take longer to perform this task than the control task of simply looking at the visual cue.
- (3) The stop-signal task: respond rapidly to indicate whether each of a series of words is an animal or non-animal; on key trials, there was a computer-emitted tone indicating that the response should be inhibited.

Miyake et al. (2000) found all three tasks involved similar processes. They used complex statistical techniques (latent variable analysis) to extract what

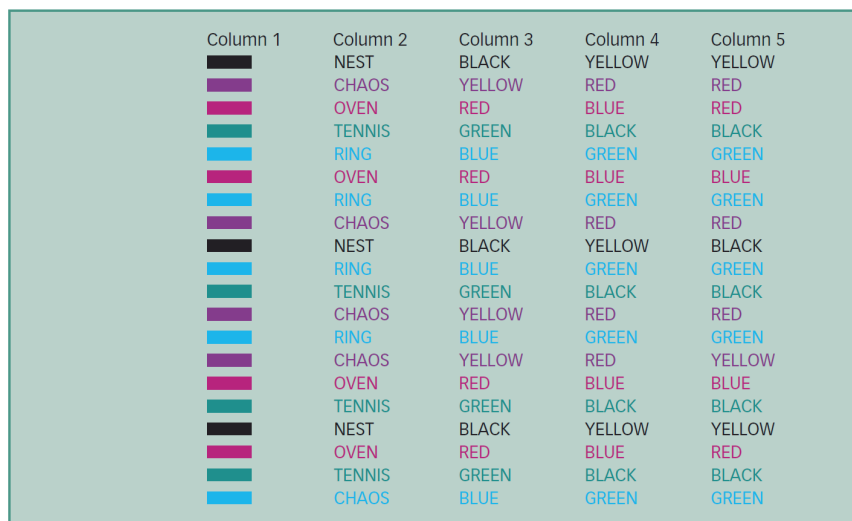
## KEY TERMS

### Parallel processing

Processing in which two or more cognitive processes occur at the same time.

### Cascade processing

Later processing stages start before earlier processing stages have been completed when performing a task.



**Figure 1.3**

Test yourself by naming the colours in each column. You should name the colours rapidly in the first three columns because there is no colour-word conflict. In contrast, colour naming should be slower (and more prone to error) when naming colours in the fourth and fifth columns.

**KEY TERMS** **Ecological validity**

The applicability (or otherwise) of the findings of laboratory studies to everyday settings.

**Implacable experimenter**

The situation in experimental research in which the experimenter's behaviour is uninfluenced by the participant's behaviour.

was common across the three tasks. This was assumed to represent a relatively pure measure of the inhibitory process. Throughout this book, we will discuss many ingenious strategies used by cognitive psychologists to identify the processes used in numerous tasks.

## Strengths

Cognitive psychology was for many years the engine room of progress in understanding human cognition and the other three approaches listed in Table 1.1 have benefitted from it. For example, cognitive neuropsychology became important 25 years after cognitive psychology. It was only when cognitive psychologists had developed reasonable accounts of healthy human cognition that the performance of brain-damaged patients could be understood fully. Before that, it was hard to decide which patterns of cognitive impairment were theoretically important.

In a similar fashion, the computational modelling activities of computational cognitive scientists are typically heavily influenced by pre-computational psychological theories. Finally, the great majority of theories driving research in cognitive neuroscience originated within cognitive psychology.

Cognitive psychology has not only had a massive influence on theorising across all four major approaches to human cognition. It has also had a predominant influence on the development of cognitive tasks and on task analysis (how a task is accomplished).

## Limitations

In spite of cognitive psychology's enormous contributions, it has several limitations. First, our behaviour in the laboratory may differ from our behaviour in everyday life. Thus, laboratory research sometimes lacks **ecological validity** – the extent to which laboratory findings are applicable to everyday life. For example, our everyday behaviour is often designed to change a situation or to influence others' behaviour. In contrast, the sequence of events in most laboratory research is based on the experimenter's predetermined plan and is uninfluenced by participants' behaviour. Wachtel (1973) used the term **implacable experimenter** to describe this state of affairs.

We must not exaggerate problems associated with lack of ecological validity. As we will see in this book, there has been a dramatic increase in applied cognitive psychology in which the emphasis is on investigating topics of general importance. Such research often has good ecological validity. Note that it is far better to carry out well-controlled experiments under laboratory conditions than poorly controlled experiments under naturalistic conditions. It is precisely because it is considerably easier for researchers to exercise experimental control in the laboratory that so much research is laboratory-based.

Second, theories in cognitive psychology are often expressed only in verbal terms (although this is becoming less common). Such theories are vague, making it hard to know precisely what predictions follow from them and thus to falsify them. These limitations can largely be overcome by

computational cognitive scientists developing cognitive models specifying precisely any given theory's assumptions.

Third, difficulties in falsifying theories have led to a proliferation of different theories on any given topic. For example, there are at least 12 different theories of working memory (see Chapter 6). Another reason for the proliferation of rather similar theories is the “toothbrush problem” (Mischel, 2008): no self-respecting cognitive psychologist wants to use anyone else's theory.

Fourth, the findings obtained using any given task or paradigm are sometimes *specific* to that paradigm and do not generalise to other (apparently similar) tasks. This is **paradigm specificity**. It means some findings are narrow in scope and applicability (Meiser, 2011). This problem can be minimised by developing theories accounting for performance across several tasks or paradigms. For example, Anderson et al. (2004; discussed later in this chapter) developed a comprehensive theoretical architecture or framework known as the Adaptive Control of Thought-Rational (ACT-R) model.

Fifth, cognitive psychologists typically obtain measures of performance speed and accuracy. These measures are very useful but provide only *indirect* evidence about internal cognitive processes. Most tasks are “impure” in that they involve several processes, and it is hard to identify the number and nature of processes involved on the basis of speed and accuracy measures.

## COGNITIVE NEUROPSYCHOLOGY

Cognitive neuropsychology focuses on the patterns of cognitive performance (intact and impaired) of brain-damaged patients having a **lesion** (structural damage to the brain caused by injury or disease). According to cognitive neuropsychologists, studying brain-damaged patients can tell us much about cognition in healthy individuals.

The above idea does not sound very promising, does it? In fact, however, cognitive neuropsychology has contributed substantially to our understanding of healthy human cognition. For example, in the 1960s, most memory researchers thought the storage of information in long-term memory depended on previous processing in short-term memory (see Chapter 6). However, Shallice and Warrington (1970) reported the case of a brain-damaged man, KF. His short-term memory was severely impaired but his long-term memory was intact. These findings played an important role in changing theories of healthy human memory.

Since cognitive neuropsychologists study brain-damaged patients, we might imagine they would be interested in the workings of the brain. In fact, many cognitive neuropsychologists pay little attention to the brain itself. According to Coltheart (2015, p. 198), for example, “Even though cognitive neuropsychologists typically study people with brain damage, . . . cognitive neuropsychology is not about the brain: it is about information-processing models of cognition.”

An increasing number of cognitive neuropsychologists disagree with Coltheart. They believe we should consider the brain, using techniques such as magnetic resonance imaging to identify the brain areas damaged in any given patient. They are also increasingly willing to study the impact of brain damage on brain processes using various neuroimaging techniques.

### KEY TERMS

#### Paradigm specificity

The findings with a given experimental task or paradigm are not replicated even when apparently very similar tasks or paradigms are used.

#### lesion

Damage within the brain resulting from injury or disease; it typically affects a restricted area.





Max Coltheart.  
Courtesy of Max Coltheart.

## Theoretical assumptions

Coltheart (2001) provided a very clear account of the major assumptions of cognitive neuropsychology. Here we will discuss these assumptions and briefly consider relevant evidence.

One key assumption is **modularity**, meaning the cognitive system consists of numerous modules or processors operating fairly independently or separately of each other. It is assumed these modules exhibit domain specificity (they respond to only one given class of stimuli). For example, there may be a face-recognition module that responds only when a face is presented.

Modular systems typically involve serial processing with processing within one module being completed before processing starts in the next module. As a result, there is very limited *interaction* among modules. There is some support for modularity from the evolutionary approach. Species with larger brains generally have more specialised brain regions that could be involved in modular processing. However, the notion that human cognition is heavily modular is hard to reconcile with neuroimaging evidence. The human brain possesses a moderately high level of connectivity (Bullmore &

Sporns, 2012; see p. 14), suggesting there is more parallel processing than assumed by most cognitive neuropsychologists.

The second major assumption is that of *anatomical modularity*. According to this assumption, each module is located in a specific brain area. Why is this assumption important? Cognitive neuropsychologists are most likely to make progress when studying brain patients with brain damage limited to a *single* module. Such patients may not exist if there is no anatomical modularity. Suppose all modules were distributed across large brain areas. If so, the great majority of brain-damaged patients would suffer damage to most modules, making it impossible to work out the number and nature of their modules.

There is evidence of anatomical modularity in the visual processing system (see Chapter 2). However, there is less support for anatomical modularity with most complex tasks. For example, consider the findings of Yarkoni et al. (2011). Across over 3,000 neuroimaging studies, some brain areas (e.g., dorsolateral prefrontal cortex; anterior cingulate cortex) were activated in 20% of them despite the great diversity of tasks involved.

The third major assumption (the “universality assumption”) is that “Individuals . . . share a similar or an equivalent organisation of their cognitive functions, and presumably have the same underlying brain anatomy”

### KEY TERM

#### Modularity

The assumption that the cognitive system consists of many fairly independent or separate modules or processors, each specialised for a given type of processing.

(de Schotten and Shallice, 2017, p. 172). If this assumption (also common within cognitive neuroscience) is false, we could not readily use the findings from individual patients to draw conclusions about the organisation of other people's cognitive systems or functional architecture.

There is accumulating evidence against the universality assumption. Tzourio-Mazoyer et al. (2004) discovered substantial differences between individuals in the location of brain networks involved in speech and language. Finn et al. (2015) found clear-cut differences between individuals in functional connectivity across the brain, concluding that "An individual's functional brain connectivity profile is both unique and reliable, similarly to a fingerprint" (p. 1669).

Duffau (2017) reviewed interesting research conducted on patients during surgery for epilepsy or a tumour. Direct electrical stimulation, which causes "a genuine virtual transient lesion" (p. 305) is applied invasively to the cortex. The patient is awakened and given various cognitive tasks while receiving stimulation. Impaired performance when direct electrical stimulation is applied to a given area indicates that area is involved in the cognitive functions assessed by the current task.

Findings obtained using direct electrical stimulation and other techniques (e.g., fMRI) led Duffau (2017) to propose a two-level model. At the *cortical* level, there is high variability across individuals in structure and function of any given brain areas. At the *subcortical* level (e.g., in premotor cortex), in contrast, there is very little variability across individuals. The findings at the cortical level seem inconsistent with the universality assumption.

The fourth assumption is *subtractivity*. The basic idea is that brain damage impairs one or more processing modules but does not change or add anything. The fifth assumption (related to subtractivity) is *transparency* (Shallice, 2015). According to the transparency assumption, the performance of a brain-damaged patient reflects the operation of a theory designed to explain the performance of healthy individuals minus the impact of their lesion.

*Why* are the subtractivity and transparency assumptions important? Suppose they are incorrect and brain-damaged patients develop new modules to compensate for their cognitive impairments. That would greatly complicate the task of learning about the intact cognitive system by studying brain-damaged patients. Consider **pure alexia**, a condition in which brain-damaged patients have severe reading problems but otherwise intact language abilities. These patients generally have a direct relationship between word length and reading speed due to letter-by-letter processing (Bormann et al., 2015). This indicates the use of a compensatory strategy differing markedly from the reading processes used by healthy adults.

## KEY TERM

### Pure alexia

Severe problems with reading but not other language skills; caused by damage to brain areas involved in visual processing.

## Research in cognitive neuropsychology

*How* do cognitive neuropsychologists set about understanding the cognitive system? Of major importance is the search for dissociations, which occur when a patient has normal performance on one task (task X) but is impaired on a second one (task Y). For example, amnesic patients perform almost normally on short-term memory tasks but are greatly impaired on many