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Précis of *The Psychology of Creative Performance and Expertise*

Kathryn J. Friedlander
School of Psychology, University of Buckingham, United Kingdom
kathryn.friedlander@buckingham.ac.uk

ORCID iD: 0000-0002-3441-0599

Author credentials

Kathryn Friedlander (PhD, CPsychol.), is a psychology lecturer at the University of Buckingham, England, where her research interests focus upon expertise development and motivational drivers in cognitive and creative performance domains such as UK-style cryptic crosswords, visual imagery vividness, quizzing, medical expertise, and creativity. She designed the innovative Undergraduate psychology module '*Creative Performance and Expertise*', which she has led since 2014; and also lectures in Educational Psychology and Cognition. Kathryn studied at Oxford for her original BA and MA in Classics, following this with a doctorate in Roman Comedy, also at Oxford. After becoming interested in the education of talented children, she pursued qualifications in Giftedness and Talent (Worcester) and Psychology (Oxford Brookes).

Abstract and keywords

The study of expertise has recently moved into an exciting phase. While previous research had a narrow focus on deliberate practice versus innate aptitude, recent multifactorial models of expertise development have breathed new life into contemporary research. Reflecting these opportunities, the *Psychology of Creative Performance and Expertise,* explores our understanding of the wide range of factors contributing to greatness in creative domains. With the intention of expanding the conversation around expertise, the book transcends traditional fields such as chess, sports, and music, exploring the intersection of expertise with creativity and the performing arts. The applied chapters therefore cover more unfamiliar fields, including extreme memory athletes, dance, creative writing, acting, art, and STEM, as well as the more conventional domains of mind games and music. Each applied chapter explores the psychological and opportunity factors that shape success within these domains, offering a close look at how creative experts develop, thrive, or falter. In other dedicated chapters, the book also examines the facilitators of creative performance, including aesthetic sensitivity, creativity, and mental imagery, as well as the obstacles to performance such as burnout, procrastination, and gender-related challenges. The exploration concludes by engaging with pressing issues facing expertise, including the impact of AI.

Addressing a gap in the market for an approachable guide to the multidimensional complexities of expertise development, this book is suitable as a resource for final-year undergraduate and postgraduate students across a range of disciplines. However, given that the book uniquely synthesizes material from the creativity, gifted and talented, and

expertise literatures in a number of unfamiliar domains, it should provide fresh insights for both newcomers and seasoned scholars alike.

Keywords: performance; performing arts; creativity; expertise; multifactorial model of expertise; giftedness; talent

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1. Why this book?

Since 2014, I've been introducing my module on Creative Performance and Expertise at the University of Buckingham with the same line: "Unfortunately, there's no textbook for this field". Admittedly, it is still somewhat rare in the UK to find an undergraduate module dedicated to the study of expertise, which is all too often tacked on as an afterthought to the Cognitive Psychology module. Yet in many ways we might argue that the study of experts, and the process of acquiring elite skills in complex domains, is more important than ever. For example, the recent pandemic reminded us of the importance of scientific expertise in tackling serious global issues, while simultaneously highlighting the value of the arts in supporting well-being, creativity and social interaction. Paradoxically, the explosion in Internet use over the last two decades has also exposed experts to unprecedented levels of hostility - a 'war on expertise' (Klein et al., 2019), whether from 'beer mat' lay-experts, those claiming fake credentials on-line, or outright expertise-deniers on social media. Meanwhile the '10,000 hours' rule continues to be widely celebrated in popular psychology, sometimes leading to publicly conducted 'experiments' in the accrual of deliberate practice, such as the 'Dan Plan' (Philips, 2017). Finally, the full impact of AI is as yet unclear, with specialized AI applications having the potential to sideline human expertise across a wide range of domains, down-skilling highly trained individuals (Dwivedi et al., 2021; 2023). Having an informed position of what, if anything, human experts can uniquely bring to the world is now vital.

1.1 What does this book add to the literature?

The study of expertise has recently come of age, as the proliferation of academic handbooks on expertise in the last 20 years indicates. Yet these volumes tend to cater to

seasoned experts already familiar with the domain. What has been lacking is a resource for those just beginning to engage with the study of expertise: a more accessible volume, laying down the foundations of understanding in important dimensions of expertise, while providing a guiding voice to help them navigate around the maze of competing theories. This is one gap that this textbook aims to fill.

At the same time, there is a growing consensus that, despite the recent surge of interest in expertise research, most literature has focused narrowly on certain practice-intensive areas such as chess, music, and sports, often neglecting other key domains of human achievement - particularly the creative arts. This oversight always struck me: with my background in the humanities, I found the imbalance curious. Why did so much emphasis fall on accuracy, replication, and skill when we know that creativity is often the cornerstone of high achievement? This led me to include disciplines such as art, dance, creative writing, and theatre in my own research and, ultimately, my teaching. *The Psychology of Creative Performance and Expertise* brings these domains to the forefront, emphasising the creative side of expertise and encouraging future researchers to expand their focus and explore new areas of human achievement.

1.2 What does the book contain?

This 16-chapter book offers a comprehensive yet accessible guide to understanding the complex and multidimensional journey towards expertise, spanning core theories and a wide range of applied domains. Initial background chapters introduce the reader to key multifactorial theories of expertise (Chapter 1) and the broad range of methodological approaches which have been used in expertise research (Chapter 2). Later chapters

(Chapters 13-15) explore the many facilitators of and obstacles to performance, including intrinsic and extrinsic motivational drivers and pressures, gender, and the often debilitating effects of performance anxiety. Additionally, two dedicated chapters (Chapters 3 and 12) explore the intersection of expertise with creativity, sensitivity, and imagination – often overlooked topics in the field.

The book applies this core knowledge to a wide range of illustrative domains, including:

- The creative arts (Chapters 6-10): music, dance, theatre/film, creative writing and art;
- Board games and puzzles (Chapters 4 and 5), including quizzing and memory challenges;
- STEM fields (Chapter 11), which are often overlooked as domains of creative expertise.

My hope is that by elevating the prominence of these subjects and consolidating the often scattered literature on expertise within these creative domains, future researchers will feel emboldened to deviate more confidently from conventional topics such as chess or sports.

In an era when artificial intelligence (AI) is rapidly advancing, I felt it was also crucial to include a forward-looking perspective. The final chapter of the book (Chapter 16) explores how we might seek to enhance human performance using both traditional (e.g. hard work) and more exotic means (e.g., drugs and neuroscientific interventions). With AI becoming more integrated into fields such as art, music, and problem-solving, the nature of

human expertise is likely to shift. This chapter offers an initial exploration of these potential challenges, inviting readers to consider the ethical and practical implications of enhancing human performance, and even how AI might replace certain expert roles altogether.

Although written in textbook style for final year and postgraduate students across a range of disciplines, this book uniquely synthesizes material from the creativity, gifted and talented, and expertise literatures, covering a number of less mainstream domains. For this reason, I hope that it provides fresh insights for both newcomers and seasoned scholars in the field. The following sections set out some of the key themes the book covers.

2. The importance of benchmarking expertise

The importance of establishing levels of expertise within a research sample cannot be overstated. Without precisely understanding participants' level of expertise, researchers risk confounding their results by assigning participants inaccurately to research groupings, or by assuming that they collectively represent a more ‘expert', or a more homogeneous, sample than is actually the case. Consistency between studies also becomes precarious: for example, Mishra points out that in one sight-reading study (Kopiez & In Lee, 2008), university piano students were considered an ‘Expert’ population; yet in an analysis of expressive timing in a Debussy prelude (Repp, 1997) they were classified as ‘non-experts’ and judged against virtuoso performers.

For these reasons, the textbook places considerable emphasis on benchmarking research samples - that is, establishing the relative level that the participants are operating at, using, wherever possible, objective, rigorous, and externally verifiable criteria. The book

opens in Table 1.1 by presenting Hoffman's (2017) levels of proficiency in expertise domains (Novice, Initiate, Apprentice, Journeyman, Expert, Master), and these terms are then adopted throughout all the following chapters. Chapter 2 provides a detailed discussion of the many approaches employed to identify expertise. Following Gobet (2017) these are broken down into performance-based criteria such as completion times, accuracy, or competition rankings, where there are objective and quantifiable performance metrics to guide us; and 'softer' measures of expertise which rely on reputation-based criteria such as self-assessment, certification, or notable achievements in the field.

Viewed through the lens of the creativity literature (particularly the Four P's model: Rhodes, 1961), eminent achievement can be assessed either by considering the 'Person' (e.g., by establishing the strength of their overall portfolio or lifetime's accomplishments) or by evaluating a single 'Product' (e.g., an artwork, a piece of choreography, an engineering design, or a poem). The textbook introduces two well-regarded techniques from the creativity field: the Creativity Achievement Questionnaire ('CAQ', Carson et al., 2005), which identifies high performers in ten creative fields (Visual Arts, Writing, and Humour; Music, Drama, and Dance; Invention, Science, and Culinary Arts; and Architecture); and the Consensual Assessment Technique ('CAT', Amabile, 1982), which can be used to assess an aesthetic or scientific product. These two techniques feature heavily throughout the applied chapters, with many worked examples.

2.1 Benchmarking in the applied chapters

Following this approach, each applied chapter begins with a focused discussion of domain-specific approaches to benchmarking expertise, often concluding that many

expertise research studies will end up employing a slightly messy, ad hoc blend of reputation-based benchmarks. Of course, it is considerably easier to establish expertise in a field such as chess (Chapter 4), where the Elo rating provides an unambiguous and objective measure of top performers, encouraging, perhaps, a saturation of studies in this domain (Grabner, 2014). Certification, such as graded music qualifications, can also help, and Mishra's (2019) suggested levels of music performance expertise (which rest heavily on Hoffman's classification) are reported in Chapter 6. But even here, these classifications fall short of defining musical expertise across the full gamut of skills (e.g. instrument building and maintenance, recording engineers, music producers, and DJs); and relate primarily to Western classical music, leading to the neglect of popular, traditional and world music forms. Similar patterns of classification apply to dance (Chapter 7), where once again, systematic dance research has generally tended to concentrate on codified conservatory-style Western concert-dance forms, such as classical and modern ballet. Building on this observation, the textbook also examines methods for benchmarking non-performing expertise, such as that of music connoisseurs, dance critics, and art valuers, where the facile equation of 'years of instruction' with expertise is particularly inappropriate.

The picture is even more murky in areas such as creative writing (Chapter 9) and art (Chapter 10), where post-modernism has questioned hierarchical distinctions, such as 'high art' versus 'popular art,' destabilising the traditional benchmarks for evaluating creative excellence. In many artistic and literary domains, this has led to a rejection of the privileging of canonical works as 'great'. This particularly affects the benchmarking of the creative 'Product', where subjective aesthetic preferences increasingly shape what is considered 'art' in the first place, complicating any objective evaluation of creative products (Chapter 10).

The textbook discusses many of these issues head-on, but picks a careful course through these potential minefields. Following Kozbelt and Kaufman (2014), a pragmatic approach is adopted, which argues that individual differences influence how successfully creative artists can communicate with their audience through emotionally resonant and conceptually innovative works; and that cognitive psychology has a key role to play in identifying the abilities and processes which underpin these differences.

3. Expertise is broader than chess, music and sport

A key aim of this book is to broaden the discourse on expertise, moving beyond the dominant domains of chess, music, and sport to include other areas of intellectual and artistic achievement. The textbook adopts a balanced approach, highlighting key studies from well-established areas, so that the reader is not left unaware of important findings, but introducing fresh material from the often scattered literature in less well-trodden territories. For example, Chapter 4 dedicates considerable attention to chess research, but also includes other mind-game pursuits such as Scrabble™, crossword solving (both cryptic and non-cryptic), jigsaws, poker, and sudoku. Exploration of these areas reveal that the findings of chess - though impressive and extensive - do not always sit well with other mind-game pursuits. For instance, classic theories on chunking, the importance of early training, and the role of deliberate practice in achieving high performance are not universally applicable to all pursuits in the mind-game field. Attention is also drawn to the many opportunities which exist to broaden research into other off-line ('table-top') genres such as escape room challenges, role-playing and story-telling genres, backgammon, Rummikub and mechanical/tiling puzzles.

3.1 Cognitive challenge beyond mind-games

Other less-common cognitive challenge areas covered in the textbook include the development of expert memory and extreme memory performance (Chapter 5). Here, a general discussion of memory structures in expertise is followed by a discussion of illustrative domains such as wine connoisseurship, competitive quizzing, and remarkable feats of recall, such as the memorization of pi to thousands of decimal places. A clear distinction is established between expert memory for information with meaning (whether incidentally or deliberately acquired) and the deliberate storage of meaningless information using mnemonic structures (such as those used at the World Memory Championship). Finally, Chapter 11 concludes with a discussion of scientific greatness, an inexplicably neglected domain of expertise research. While acknowledging the different realms of science and their specific skill requirements, the chapter explores a number of suggested preconditions for becoming a scientist (particularly in the more technical areas), including above-average intelligence and spatial ability. The argument is also made for science to be considered an inherently creative field of endeavour (see section 4 below).

3.2 Fresh perspectives on musicality: the architectonic and expressive ear

No discussion of the performing arts would be complete without a chapter on musical expertise. The literature on music psychology is vast, but the reader is guided through the main drivers of excellence in the music domain, using a multifactorial model of expertise based on Gagné's Differentiating Model of Giftedness and Talent (McPherson & Williamon, 2015).

One significant contribution of this textbook is its clarification of the often nebulous

terms ‘musicality’ and ‘musicianship,’ culminating in a new model of musicality. Drawing widely from the music psychology literature, this model comprises more concrete skills, such as audiation, musical memory, perceptual acuity, and technical mastery, but supplements these with broader skills relating to artistic sensitivity and expert knowledge. For example, Kirnaskaya’s (2009) term ‘architectonic ear’ (relating to an individual’s capacity to discern and appreciate the structural and aesthetic coherence of a piece) is explicitly linked to the ‘skill-by-structure’ account of expert memory acquisition (Lehmann et al., 2018) discussed in Chapters 4 and 5. This argues for the gradual acquisition of increasingly complex mental representations of domain-relevant knowledge, within a strong retrieval structure. The term ‘architectonic ear’(/eye/knowledge) is an important cross-discipline theme of the book, with discussions appearing in further applied chapters including acting, art, creative writing, dance, music and science. It is this architectonic understanding which is argued to allow comprehension of the underlying messages of an artwork or product, its genre, period and creator, and the social and cultural context of its creation.

Equally importantly, Kirnaskaya’s term ‘expressive ear’ (relating to an individual’s ability to extract the emotional meaning and feelings within a musical piece) has counterparts in other performance domains, such as creative writing, acting, art, and dance. Expertise is often couched in terms of ‘problem-solving’, whereby experts are argued to solve problems more quickly, reliably, accurately and effectively than non-experts (Sternberg et al., 2011). This textbook argues that those in the performing arts are equally confronted with a problem-solving challenge: that of developing a deeper understanding of the work, gaining an aesthetic appreciation of its meaning and shape, and crafting an individual interpretation to communicate effectively with the audience. Techniques such as

method acting (Chapter 8) enable performers to "live truthfully under imaginary circumstances" (Meisner & Longwell, 1987, p.15), achieving a level of immersion which allows them to embody the role authentically. Equally, a captivated audience might also feel an 'adhesion to fiction' as they are drawn as if 'for real' into the narrative, experiencing the emotions and stakes as if they were personally involved (whether in music, dance, theatre, film, art, or creative literature); and this unusual aesthetic experience (Chapter 12) will influence their affective response to the work.

3.3 Charting artistic excellence beyond music

Beyond the musical domain, the textbook brings together literature on dance, theatre, creative writing, and art - areas of artistic expertise that have often been overlooked or underexplored in expertise research. A key objective in each of these areas was that of charting the key skill-sets that facilitate excellence, despite the somewhat fragmented literature, and of establishing working models to facilitate future research.

Recognizing the inextricable connections between music and dance, and the crucial role of 'musicality' in dance expertise, Chapter 7 introduces an innovative model of dance artistry. This model builds on core elements of musicality from Chapter 6 (such as the perception of rhythm, tempo and melody) but broadens them to encompass movement through space, athleticism, and physical endurance. Dancers have been argued to be particularly attuned to the way humans move, extracting nuanced information from the movements of others, and echoing this in their own motions. This is linked to the 'expressive ear/eye' of Kirnaskaya, and discussed in the light of the copious neuroscientific research into the heightened sensitivity to biological motion and the specialised activation

of mirror neurons in dancers.

In the field of acting, it was particularly gratifying to spotlight the groundbreaking, yet surprisingly neglected, work of Blix (2004), culminating in a 'Skills Wheel of Acting' which forms the backbone of Chapter 8. Acting skills are also explored through the seminal work of Noice and Noice (e.g. 2013), addressing the question of how actors manage to remember their lines while delivering an authentic performance. Excellence in acting is argued to rest on the ability to 'live truthfully' within the role, a principle rooted in the teachings of Stanislavsky (the father of 'method acting'). Great actors are argued to balance on the cusp of two identities: the character they are portraying, and the professional actor who is crafting the role. Inhabiting their role is crucially dependent upon the ability to adopt a position of empathetic congruency with their character, and to embody this understanding authentically by intentionally enacting appropriate gestures and voice. The relationship of this moment with flow is examined here, and revisited in Chapter 13 across a number of performance domains.

Similarly, the canonical cognitive processing model of writing proposed by Flower and Hayes (1981) afforded ample opportunity in Chapter 9 to explore a number of subplots, including how writers generate ideas in the first place; and how the unusual use of language, including metaphor, incongruent juxtaposition and humour, can lead to novelty of written expression. Once again, the cognitive factors important to text creation (such as linguistic skills, size of vocabulary, general knowledge and working memory) are considered alongside key ingredients for creative text generation, such as sensitivity to the rhythm and melody of language, divergency of thought, empathetic truthfulness, mental story-boarding,

and flow.

Finally, the discussion of expertise in visual art (Chapter 10) takes the opportunity to consider expertise from two different viewpoints. The initial sections discuss expertise in art appreciation, involving the exploration of complex constructs such as aesthetic judgment (encompassing considerations of symmetry, complexity, and balance) and aesthetic experiences (including emotional arousal, knowledge, personal preferences, and immersion). Later sections explore the cognitive and perceptual underpinnings of artistic skill itself, drawing on work by Chamberlain, Kozbelt, Drake and Winner (e.g. Chamberlain, 2017; Drake et al., 2021; Kozbelt & Ostrofsky, 2018). Here, attention is also paid to the creative process of generating artistic works, with key models including Winner's Eight Studio Habits of Mind (2006) and the extensive research by Botella and colleagues (e.g. 2018) into the iterative problem-solving strategies artists use throughout the stages of creation.

Throughout Chapters 6-10, attention is drawn to both current research biases (e.g., the neurocognitive focus on ballet in dance expertise research; or the concentration on realistic drawing in visual arts) and the emerging opportunities for expanding expertise research across more diverse genres and artistic forms.

4. Expertise: efficient execution or creative production?

The expertise literature primarily assumes that expert performance depends on reliable, reproducible skill acquisition. This makes perfect sense for those areas, such as chess, in which the rules of the domain are well established and rely on replicable

behaviours following previously learned strategies. However, in many complex expert domains, the pathway to greatness lies in reinvention and innovation in approach and execution, to surpass that which has been achieved before. As Scott Barry Kaufman puts it: “While Kobe Bryant showcasing the same slam dunk and Tiger Woods getting a hole in one will reliably induce public applause, scientists can't keep publishing the same paper over and over again, and writers can't keep writing the same critically acclaimed novel over and over again and expect the same acclaim” (2016, para. 4). For Gagné, too, creative abilities play a crucial role across diverse professional areas, including “scientific research, fiction writing, TV or film scenarios, choreography (dance, skating, gymnastics), and many more similar "creative" professional occupations (e.g. architecture, civil engineering, academic handbooks)”, (2014, p.203).

It is thus curious that the expertise literature largely overlooks the construct of ‘creativity’, which is omitted from most multifactorial models of expertise. This may potentially have arisen from the overwhelming focus on fields such as chess, sport and musical performance, where the benefits of deliberate practice and the goals of efficient and replicable performance have been so extensively documented. For discussion of the relationship between expertise and creativity, we previously needed to turn to Gagné’s DMGT model, which is rooted in the giftedness and talent literature, or to componential models of creativity, such as those of Renzulli (1986; 2021), Amabile (1996, 2013), and Sternberg and Lubart (1996). In two dedicated chapters (Chapters 3 and 12), the textbook sets out to rectify this situation, making the case for wider recognition of the relevance of creativity and aesthetic sensitivity for eminent performance. This approach is also adopted throughout the applied chapters, with dedicated discussion of creativity within each field.

4.1 Parallels between creative and expertise development

Drawing widely from both the creativity and giftedness literature, Chapter 3 defines creativity as a construct, and explores the close parallels between a number of creativity and expertise frameworks, proposing a new unifying developmental model featuring the 4 C's model of creativity (mini-/little-/Pro-/Big-C, Kaufman & Beghetto, 2009) and Hoffman's (2017) stages of expertise. The argument is made that, in both models, not all individuals will travel through every proficiency stage, with many remaining at the lower levels of creativity (mini/little-c) and expertise (Novice/Apprentice/Journeyman) in any given domain; and only a few achieving Expert (Journeyman/Pro-c) or Master (Big-C, game-changing) contributions. As Olszewski-Kubilius and colleagues (2017) put it, "The type of creativity an individual manifests changes over time and is one of the features that distinguishes ability from competence, competence from expertise, and expertise from eminence" (p. 63).

The chapter challenges traditional approaches, such as those advocated by Simonton (2012) and Tannenbaum (2000a) which view experts as those who merely "master the existing paradigms of a discipline or domain or what others before them have discovered and developed" (Subotnik et al., 2011, p.16). While the description may aptly describe the Journeyman expert—proficient, reliable, and self-directed—it fails to capture those operating at higher levels, where innovative problem-solving, interpretative performance, or product creation become essential to advancing the field. One issue may stem from how 'creative production' is defined, with some models (e.g. Simonton, 2012) suggesting that an 'expert' approach based exclusively on the steady incrementation of existing knowledge is

inherently uncreative. Again, Chapter 3 counters this claim by pointing to a number of models from the creativity literature (e.g. Kirton's model of adaptation/innovation, 1978) which propose that both modest adaptation and radical innovation are both creative behaviours, differentiated primarily by degree rather than presence. One such model, the Propulsion Theory of Creativity (Sternberg et al., 2001), is used extensively throughout the applied chapters to interpret creative contributions within fields such as film-making, painting, music, novel writing, and scientific invention.

4.2 Personality, sensitivity and the 'artistic temperament'

Individuals involved in artistically creative work are often notably sensitive to both their surroundings and inner experiences, a key theme of the applied chapters 6–10 and of Chapter 12. Ezra Pound described creative artists as "the antennae of the [human] race" (Runco, 2014, p. 285), sensitive to gaps, shifts, and the mood of the times. These individuals are seen as emotionally and aesthetically responsive, highly imaginative, and, at times, more susceptible to mental health challenges than the general population.

In line with a multifactorial model of expertise, considerable attention is therefore paid to the sensitivity-related intrapersonal qualities that contribute to the 'artistic temperament'. Chief among these is the Big Five trait of Openness to Experience, where facets such as 'openness to aesthetics/feelings/fantasy' appear particularly relevant to artistic domains, and the 'intellect' facet to scientific and intellectual pursuits. Chapter 12 examines the link between Openness and unusual aesthetic experiences, including goosebumps, aesthetic chills, awe, and feelings of beauty. This chapter then broadens the discussion to focus on sensitivity, with an emphasis on temperament theory. Drawing on

Ilbury and colleagues (2024), the book integrates diverse multidisciplinary perspectives on heightened sensitivity, including Dabrowski's Overexcitability (1972), Aron's Sensory Processing Sensitivity (2012), Carver and White's BIS/BAS theory (1994), and Evans and Rothbart's Orienting Sensitivity (2007). Common to all is the argument that heightened sensitivity entails a deeper processing of sensory information, whether from the external environment or internal emotional states.

Heightened neurosensitivity has been described as a 'for better and for worse' trait (Belsky et al., 2007). In other words, while supportive environments may encourage flourishing ('vantage sensitivity,' Pluess, 2015), unsupportive settings can lead to negative outcomes ('vulnerability', Aron et al., 2012; Pluess, 2015). Although psychological research often focuses on negative emotional reactivity, Aron argues that heightened sensitivity in enriching environments may also support positive traits, such as curiosity, excitement, attention to detail, and emotional depth, a perspective which may help to explain the mixed findings on the link between mental health and artistic creativity. Chapters 9, 10, and 12 debate these associations further, arguing that fantasy-proneness, sensitivity, and over-inclusive thought, particularly in fields such as creative writing (especially poets) and visual art, may provide some supporting evidence for the enduring 'mad genius' trope.

4.3 Imagination and mental imagery

Visual imagery, imagination, and fantasy are central yet frequently underexamined facets of creative expertise, playing a pivotal role in the generative processes underlying innovation. These constructs, while conceptually distinct, frequently overlap and interact in complex ways to facilitate creative production. Chapter 12 defines these constructs, using

Abraham's (2016, 2020) neurophilosophical framework of the imagination (comprising mental imagery, intentionality, novel combinatorial thinking, altered states, and phenomenology); and care is also taken to define a range of core terms (such as mental imagery, visual imagery, mental practice, paracosm, fantasy and mental story-boarding). Chapter 12, in conjunction with the applied chapters, illustrates how visual imagery underpins both practical skill acquisition and high-level creative innovation across diverse domains.

'Proximal' mental imagery (Meyer et al., 2019), termed 'intentionality' in Abraham's model, relates to the recall of familiar, everyday experiences and serves a more practical function. It is used, for example, to facilitate mental rehearsal among musicians, dancers and actors (Chapters 6, 7, 8; and Chapter 12). Musicians clearly use auditory imagery to hear notes in their mind ('audiation'), whether sight-reading a new piece or playing back a familiar piece to revisit the performance nuances they wish to incorporate. Similarly, dancers might 'hear the music' as they mentally rehearse their steps. Rehearsal also activates the motor cortex, employing motor or kinaesthetic imagery to practise dance steps or instrument fingerings without actual physical movement. Actors similarly revisit specific scene elements (stage 'blocking') in their minds, such as cues, entrances, stage locations, gestures, and props. Mental imagery may also be important in storing and retrieving mental journeys using memory techniques such as the 'methods of loci' (Chapter 5), in recalling the layout of a chess board in blindfold chess (Chapter 4), and in facilitating mental manipulation and rotation in scientific fields such as engineering (Chapter 11).

Emotional or interoceptive imagery takes this further, enabling performers to

explore their own feelings, and to decide how they want to deliver a spoken line or apply expressive details such as rubato in music. This form of mental rehearsal also helps performers to develop, refine and memorize performance cues and content addresses, promoting the secure recall of a piece. It can also be a powerful tool in managing situational uncertainties including stage fright, thereby enhancing a performer's overall performance readiness.

Nevertheless, the capacity for generative ('distal', Meyer et al., 2019) imagery also emerges throughout the book as a critical driver of creative production and performance. For example, the ability to conjure up vibrant and complex mental scenes is essential if actors, and the characters created by writers, are to "live truthfully under imaginary circumstances" (Chapters 8 and 9). In line with this, engaging in the inner world of rich imaginary-world play (paracosm) is identified by Thomson and Jaque (2017) as a key characteristic of young actors. Writers, too, immerse themselves in the 'fictionworld' (Doyle, 1998), with the characters sometimes taking over the writing as the author 'relinquished writing agency to them'. So real was the evoked imagery, that writers reported sadness and episodes of weeping or chills as they wrote. Friedlander and colleagues (2022) describe this process as a form of mental 'story-boarding': the detailed visualisation of imaginary scenes for elements such as character development, perspective taking, story arc, scriptwriting, and mise-en-scène. The vivid aesthetic 'reliving' and re-purposing of colour, texture, scent, taste, or form is also suggested to be a contributory factor in expertise areas such as dress design, and culinary or visual art.

Finally, distal mental imagery can promote counterfactual thinking (alternative

temporal, spatial, social, and hypothetical realities transcending the here-and-now, Abraham, 2016) which can also facilitate conceptual expansion. In line with Boden's (1995) characterisation of creativity as an exploratory and transformational process, conceptual expansion breaks free from the constraints of existing categories and knowledge structures, in order to explore novel and untrodden territories (Abraham, 2014; Ward, 1994). These transformational ways of thinking revolutionise our approaches - whether "ways of writing prose or poetry; genres of sculpture, painting, or music; theories in chemistry, biology, or mathematics; habits of couture; systems of choreography" (Boden, 1995, p.75). This theme recurs in applied contexts, particularly in discussions of theatre and film (Chapter 8), creative writing (Chapter 9), art (Chapter 10), and science (Chapter 11), where these revolutionary approaches are argued to be characteristic of 'Big C/Master' levels of game-changing innovation.

Yet, despite the intuitive connection between creativity and vivid imagination, empirical research offers only weak correlations between visual imagery vividness (VIV) and divergent thinking scores, often considered a hallmark of creative thinking (LeBoutillier & Marks, 2003). Chapter 12 therefore introduces the Multifactorial Model of Visual Imagery (MMVI, Friedlander et al., 2022), which provides a nuanced framework for understanding these complexities. The MMVI argues that only certain forms of imagery - primarily those supporting generative processes such as conceptual expansion, novel combinatorial thinking, vivid aesthetic reliving, and mental storyboarding - align with creative expertise. Building on key models, such as Blazhenkova and Kozhevnikov's (2009) Object-Spatial framework and Meyer et al.'s (2019) Proximal-Distal theory, the MMVI argues that visual imagery operates along multiple dimensions, not all of which support creative production,

thus explaining why prior studies (particularly those relying on the Vividness of Visual Imagery Questionnaire (Marks, 1973), a measure of proximal visual imagery), yielded inconsistent results.

5. Beyond Aptitudes and Practice: A Multifactorial Model of Expertise

For too long, the study of expertise was mired in a prolonged debate regarding the relative contribution of aptitudes and practice (Hambrick et al., 2016), and this has acted as an unwelcome distraction preventing us from exploring a wide range of other promising contributors to expertise development. It is therefore very welcome that more recent multifactorial models of high performance embrace a wider range of contributors such as personal traits, motivations and physical qualities, the environment we were brought up in, and the opportunities we are offered along the way. Nevertheless, the previous focus on the nature/nurture debate means that broader intrapersonal and contextual factors have been somewhat neglected in the expertise field. The textbook seeks to remedy this by featuring well-established literature on this topic from the creativity and gifted and talented fields, drawing particularly on the works of Gagné (DMGT, 2014), Amabile (the Componential Theory of Creativity, 2013), and Subotnik and colleagues (2011). This focus is expanded in Chapters 13-15, which explore the facilitators of and obstacles to high performance in detail. Below, some key themes are outlined.

5.1 Facilitators of and obstacles to expertise development

The pathway to eminence is not always smooth, meaning that performers are characterized not only by their exceptional abilities but by their deep, tenacious commitment and persistent engagement with their talent domains, seeing this as vital to

their well-being, powers of expression, and life-satisfaction (Morelock, 2013). Chapters 13 and 14 are dedicated to the exploration of this 'Faustian' characteristic defined as "an insatiable urge in individuals to explore the unknown and even the unknowable, to reach the unreachable, to grasp at the fringes of eternity, as it were, no matter what sacrifices are necessary to solve the mysteries of the universe and to serve the cause of aesthetics" (Tannenbaum, 2000b, p.24). Such passion propels individuals to enhance their skills relentlessly, often immersing themselves so deeply in the activity, even from an early age, that they find it challenging to disengage (the 'Rage to Master', Winner & Drake, 2013). Chapters 13 and 14 review the deeply ambiguous nature of this commitment. Harmonious passion (Bonneville-Roussy & Vallerand, 2017), for example, is seen to resonate with the euphoria of Csikszentmihalyi's flow, and leads to thriving. Yet its more negative counterpart, obsessive passion, may also result in rigidity, over-training, burnout, and negative self-reflections, potentially eroding confidence and creative prowess. The point is made throughout that striving for fame, wealth, or academic recognition can be double-edged, with facilitators (e.g. deliberate practice) sometimes leading to unintended obstacles, such as a spiralling demand for precocity, or problematic or maladaptive behaviours such as procrastination, shame, and imposter phenomenon. These issues are further explored in Chapter 15, in a dedicated discussion of performance anxiety.

5.1.1. Passion or grit? Facilitators of performance

The existence of an early drive to excel has sometimes been downplayed by the proponents of the deliberate practice route to excellence. For example, Howe and colleagues (1998) argued that all early signs of potential talent are simply a product of 'pushy' parenting ("there is no firm evidence of exceptional early progress without above-

average degrees of parental support and encouragement", p.403). Nevertheless, most multifactorial models of expertise development identify several important moderators of performance outcomes, including personal qualities such as drive, task commitment and self-awareness which can emerge from an early age. These are also set into the context of the environment the performer is working in: its support structures, cultural climate, and fortuitous opportunities that can be grasped along the way.

Chapter 13 draws on Gagné's DMGT to propose a tripartite framework for personal goal management. This model aligns internal drive (motivation), self-understanding (awareness), and the will to act (volition) towards achieving domain-specific objectives. Successful goal management thus establishes a balance between long-term aspirations and short-term objectives, ensuring consistent progress and adaptability in the journey towards mastery. The discussion in Chapter 13 of intrinsic and extrinsic motivational drives includes sections on harmonious passion, need for cognition, fun, flow, and achievement goals. The efficacy of intrinsic motivators is well-established in the literature, with peak performance occurring when individuals are propelled by internal drives related to personal fulfilment; exercise personal autonomy; and maintain an internal locus of causality (Malik & Butt, 2017). Yet extrinsic motivators are also an important behavioural catalyst in many domains, with many performers in the applied chapters feeling the drive to showcase expertise by exhibiting it to others - whether in quizzing, competitive chess, academic paper-writing or the performing arts. Self-awareness encompasses core elements such as self-identity, self-efficacy, and self-esteem, helping individuals navigate their potential ('Who am I?' 'Can I do it?') and assess their growth ('What could I become?'), including a discussion of reflective versus brooding rumination. Finally task commitment is explored through the lens of four

key constructs: self-control, grit, the rage to master, and resilience. The construct of grit, which has enjoyed considerable popularity, especially in educational circles, is subjected to close scrutiny: the suggestion is made that the predictive power of grit could be considerably enhanced if combined with measures of passion and resilience.

Chapter 13 then turns to a discussion of environmental factors that foster exceptional performance. A tripartite structure is again adopted, featuring foundations at home (e.g. financial support, enrichment, parenting style), scaffolds of success (e.g. access to training facilities and mentors) and twists of fate (e.g. crystallising moments and chance). Homelife is seen as a crucial influence in the development of exceptional performance (McPherson, 2009). From the sacrifices families make, to the educational enrichment they provide, to the consistent scaffolding and support they offer, each element plays a significant role. Particular attention is paid to the interplay between a child's innate tendencies and their upbringing, with a detailed discussion of genotype-environment interactions (Plomin et al., 2014). Parenting styles (e.g. Maccoby & Martin, 1983) are introduced here: these not only reflect cultural and familial norms but can also be seen as responses to or reinforcements of a child's genetic predispositions. This means that they can significantly impact the way these predispositions are nurtured or stifled (Thomson & Jaque, 2017). While many parents offer nurturing environments that foster growth, Chapter 14 highlights how certain approaches, such as the 'Tiger Mother' model, can push the boundaries of support and pressure. This balance between encouragement and overreach highlights the nuanced role of family in shaping creative and high-performance outcomes. Finally, the discussion of serendipity sheds light on how luck, individual agency, preparedness, engagement, and arising opportunities interact, making the impact of chance

less arbitrary than it might first appear.

5.1.2 Navigating obstacles: the road-block to success

In the pursuit of performance excellence, individuals often encounter an array of formidable challenges. Across the applied chapters, the textbook draws attention to the trials, setbacks, and motivational hurdles individuals face, each requiring a blend of resilience and determination to overcome. Chapter 14 consolidates these challenges, drawing on Chapter 13's exploration of the double-edged nature of skill acquisition. Once again, sources from outside the expertise literature - specifically the gifted and talented, and creativity literature - are synthesized in this discussion to address a comparative gap in expertise research. The chapter is organized into four sections, each focusing on a distinct performance obstacle, arguing that many of these challenges are unintended by-products of extensive deliberate practice. Chapter 14 begins with the personal challenge of living up to early promise, and then turns to discussing burnout, self-sabotaging cognitions, and the influence of gender (see section 5.2 below). These sections together explore some of the most prominent issues individuals encounter on their journey toward excellence, setting the scene for the discussion of performance anxiety in Chapter 15.

Aspiring experts and creative performers often find themselves burdened by substantial external expectations leading to a crippling fear of failure. Often singled out at an early age for signs of aptitude, or selected to work and perform in elite institutions and venues, talented individuals can also suffer from a crisis of identity and purpose during adolescence. The textbook highlights the dangers implied by an increasing demand for early specialisation and extreme precocity in competitive domains such as music, gymnastics, ice-

skating, chess, swimming, and football. Similar concerns for those achieving 'too much, too young' are explored in regard to the performing arts, particularly pop music, acting and ballet. Drawing from research on giftedness and talent, the difficulties of making the transition from prodigy/child star to successful adult performer are highlighted, with particular attention paid to the roles of parents and coaches in steering their charges safely through a number of challenges which might arise. As previously noted in Chapter 13, parenting style is key, and this is discussed in relation to blame, shame, imposter phenomenon, and the fear of failure.

Achieving world-class status in any field demands rigorous training, dedication, focus, and motivation. For some, this can be deeply rewarding, with the many hours of deliberate practice leading to success and lasting engagement in their field. Yet for others, the experience can become overwhelming, leading to distress, exhaustion and the early termination of a promising career. The textbook examines the heightened risk of burnout among individuals in creative expertise domains. Contributing factors are argued to include poor work-life balance, unhealthy emotional investment (such as boundary-blurring in acting), perfectionism, limited social support, and workplace dynamics that undermine autonomy. The particular pressures of working in scientific fields within academia are noted, and are linked with the perverse incentives to publish eye-catching and counter-intuitive results, driving the proliferation of unethical and fraudulent research.

The discussion of maladaptive cognitions continues with three further topics on the theme of self-sabotage: procrastination, self-handicapping, and maladaptive rumination. These are picked up again briefly in Chapter 15 which discusses their role in fostering

performance anxiety. Many of these maladaptive cognitions are argued to involve "the deliberate creation of conditions by which failure can be attributed to causes outside the person's control" (Geen, 1995, p.97). In other words, self-imposed barriers are introduced which hinder a successful outcome, meaning that a degree of "attributional ambiguity" (Ferrari & Tice, 2000, p.74) can be generated, acting as a shield for self-worth. The textbook links this mindset to social comparison, and socially-prescribed perfectionism.

Meanwhile, excessive rumination on failure lowers self-esteem, exacerbates performance anxiety, and leaves performers struggling with self-blame, panic, and a fear of losing control. Chapter 15 reviews the literature on performance anxiety (including stage fright) in greater depth, discussing optimal levels of arousal, and the impacts of challenge, threat, distraction and explicit monitoring, together with considerations of working memory overload. The chapter ties its discussion into performance areas covered earlier in the textbook, such as music, dance, acting, and quizzing, alongside the introduction of new expertise areas such as public speaking, and academic lecturing. The chapter concludes by exploring interventions for addressing performance anxiety within the autonomic, behavioural, and cognitive framework established earlier in the chapter, with forward links to Chapter 16 (ethics of performance enhancement) in the case of pharmaceutical treatments.

5.2 The penalty of being female

Although many multifactorial models of expertise mention intra- and interpersonal traits together with physical attributes such as strength, they are curiously silent on gender, which is arguably one of the most important moderators of likely expertise outcomes,

affecting other moderators such as ‘Opportunity’. Notably, Gobet (2015) briefly considers gender disparities in the context of individual differences in expertise, touching on factors such as participation rates, sociocultural barriers, and cognitive differences. However, broader multifactorial models have yet to fully integrate gender as a central moderator of expertise development. Accordingly, a more comprehensive analysis of gender’s role in expertise development is warranted. Each of the applied chapters within the textbook therefore explicitly considers the balance between male and female participation in the relevant expertise domain, and Chapter 14 consolidates the underlying factors contributing to the under-representation of women, and the tendency to characterise their abilities as inferior in a wide range of expertise fields. Institutional restrictions, entrenched stereotypes, and structural inequalities are argued to continue to hinder their participation, advancement, and recognition.

The low representation of women in expert and creative performance fields has been a long-standing concern. Despite breakthroughs in areas such as creative writing (Chapter 9) and the World Memory Championship (Chapter 5), where women have recently demonstrated equal dominance, barriers persist in many other domains, hindering participation and recognition. Classical ballet (Chapter 7) serves as a striking counterexample of a field where women predominate, at least at the performance level; yet men continue to predominate in ‘power positions’ such as choreographic and artistic/executive director roles (the ‘Glass Slipper Ceiling’ effect: Meglin & Brooks, 2012). Chapter 14 highlights how institutional barriers, such as exclusion from elite training or prestigious roles (e.g. top orchestras, the Royal Academy or Oxbridge), have stymied women's progress for centuries across a wide range of domains. The exclusion of females

694 from these influential establishments is argued not only to have weakened women's
695 networking and mentoring opportunities, but also to have hindered the acceptance and
696 normalization of women in the relevant field. Similarly, systemic biases reinforce
697 perceptions of male 'brilliance', conceptualising female contributions as arising from
698 diligence rather than talent.
699
700 Unconscious bias also plays a critical role. Chapter 14 notes that recruitment studies
701 reveal a preference for 'male' candidates even with identical qualifications, while creative
702 outputs (such as artworks) assigned to 'female' names are judged less valuable. Openly
703 hostile environments in male-dominated domains further intensify these challenges.
704 Whether in poker (Chapter 4), music (Chapter 6), art (Chapter 10), or STEM (Chapter 11),
705 women often face intimidation, exclusion, and pervasive sexism, discouraging participation
706 at higher levels, and erasing their achievements from the annals of history. Meanwhile, in
707 both art and film, the 'male gaze' is argued to dictate narratives, sidelining women to
708 secondary or stereotypical roles. Such biases exacerbate disparities, diminishing women's
709 visibility and leaving subsequent generations bereft of role models.
710
711 Compounding these challenges is the burden of domestic and caregiving
712 responsibilities, disproportionately shouldered by women. This 'cognitive labour', ranging
713 from childcare to household management, is noted to sap the focus and energy needed for
714 creative or professional excellence. Women in performance and scientific fields also
715 frequently report discriminatory practices related to motherhood, from job insecurity to
716 aesthetic prejudices during pregnancy, leaving many to navigate careers without adequate
717 institutional support. Furthermore, the penalty of being female also extends beyond the

718 structural to the cultural. Chapters 6, 11 and 14 outline how gender stereotypes steer girls
719 away from domains perceived as requiring 'macho' characteristics, 'brilliance', or
720 mechanical/mathematical skill while encouraging nurturing and compliant roles. These
721 stereotypes are argued to shape early choices, influencing everything from toy or musical
722 instrument selection to career paths.
723
724 Cognitive differences between males and females have been suggested (e.g. Gobet,
725 2015; Halpern, 2011) to explain disparities in female participation at the highest levels of
726 expertise (Chapters 4, 11, and 14). Three key aspects are explored in this respect:
727 visuospatial reasoning, non-right-handedness, and systemizing. The evidence on the roles
728 played by handedness and systemizing is, however, argued not to be unequivocal. For
729 example, self-reported scores on systemizing and empathizing scales may in large part be
730 influenced by the internalization of stereotypes, such as the belief that girls are better
731 suited to nurturing roles (Chapter 11). Chapter 14 notes that gender differences in some
732 spatial and mechanical tasks, such as timing judgements about moving objects
733 (spatiotemporal reasoning) and mental rotation, appear more robustly founded. However,
734 Chapter 11 also highlights how social stereotyping frequently deters girls from enhancing
735 their visuospatial skills through activities such as construction toy play. It is also instructive
736 to consider that, despite the well-established female advantage in verbal activities (Halpern
737 et al., 2007), male dominance in the domain of creative writing has only recently begun to
738 recede, raising questions as to whether cognitive differences are truly the crucial
739 determinant of gender disparities.
740
741 In the end, the textbook adopts the conclusion of Halpern and colleagues (2007)

that, "The similarities between males and females are so numerous and obvious that we tend to overlook them and take them for granted" (p.4). While cognitive differences do exist, they are not sufficiently large to account for the substantial disparities in representation between females and males at higher levels of expertise. Rather, as argued throughout the textbook, these differences are profoundly shaped by entrenched sociocultural factors.

5.3 The importance of practice

While multifactorial models expand our perspective on expertise, they continue to highlight the indispensable role of deliberate practice as a central component. Indeed, most modern explanations of elite performance fully acknowledge the critical role of structured training, while contending that innate ability (together with a wide range of other factors) must also form part of the picture. This viewpoint is commonly summarised by acknowledging the necessity of deliberate practice (you cannot get to be world class at anything without working at it), while denying that it is sufficient, in itself, to produce levels of high expertise (e.g. Campitelli & Gobet, 2011). This balanced stance is taken in the textbook, which tackles the question of deliberate practice head-on in each of the applied chapters.

Chapter 1 reviews the supporting evidence in favour of deliberate practice, noting its substantial impact in highly-coached areas such as sport and music. Nonetheless, a more nuanced approach concedes that the extent to which deliberate practice contributes to expertise varies significantly both across and within domains. In line with this, the wide variability in levels of deliberate practice required for high-level talent acquisition is noted,

766 together with the findings from meta-analytical studies drawing on practice data across a
767 wide range of domains (e.g. Macnamara et al., 2014). The argument is also made that
768 performers with exceptional aptitude or proclivity for a field often show such strong
769 intrinsic drive to succeed, fuelled by passion for their subject area, that they willingly
770 immerse themselves in gruelling practice (the 'Rage to Master'), initiating a 'virtuous cycle'
771 where passion and progress reinforce one another, driving accelerated improvement.
772 Following this line of thinking, it makes sense that people may gravitate towards
773 environments which are particularly in tune with and supportive of their abilities and
774 preferences (Lubinski, 1996), in a process known as 'niche-picking' (Roberts & Nickel, 2017).
775 Here, genes and environments are argued to exhibit covariation, whereby personal
776 strengths and a favourable environment work together synergistically (Ullén et al., 2015)
777 allowing us to become agents in making life-choices which give us the best chance of self-
778 fulfilment.
779
780 Building on this, the chapter critiques the 'deliberate practice' approach, including
781 discussion of whether deliberate practice is always inherently unenjoyable (see also the
782 discussion in Chapter 6 on music practice), its relationship to 'deliberate play' (Côté et al.,
783 2007), and whether it requires the direct guidance of a knowledgeable coach (or whether
784 the performer could devise their own training regime). Chapter 2 extends this discussion by
785 evaluating Ericsson's Expert Performance Approach, highlighting both its utility and
786 methodological drawbacks.
787
788 **6. What about the future of expertise?**
789 In its final chapter, the book adopts a more philosophical perspective, exploring the

ethical quandaries arising from attempts to enhance human performance, particularly where this affects cognition or the delivery of expert-level performance. Looking to the future, the chapter examines the intersection of Artificial Intelligence (AI) and human creative outputs. It raises questions about the nature of human versus AI and probes the human-machine interface across a wide range of expert performance fields such as medicine, music, film, STEM research, and art. This discussion is set into the background of the 'war on experts' (a societal trend characterised by growing scepticism and hostility toward expertise), and the extreme competitive and performance demands on those aspiring to rise to or to remain at the top of their profession.

6.1 Experts under pressure

Throughout the course of history, humans have sought to improve their performance. From the inception of language and the advent of writing, to the development of the printing press, calculators, and computers, each epoch has witnessed significant advancements. Yet the pace of change has accelerated dramatically in recent decades, and in our increasingly complex and technological world there is a new urgency for humans to reach even higher pinnacles of efficiency and achievement, with workplace demands implicitly or explicitly requiring individuals to remain permanently at the top of their game. The chapter draws connections between these competitive pressures and the allure of strategies that promise shortcuts to expertise, whether through pharmaceuticals, brain stimulation techniques, or the inappropriate use of AI. For example, the perverse incentives to publish fraudulent research, noted in Chapter 14, have led to the production (and successful publication) of substandard, unoriginal, and scientifically flawed papers using generative pre-trained transformer (GPT) systems such as ChatGPT.

These pressures are argued to have arisen at a particularly difficult time, as experts in many fields face unprecedented levels of hostility. In their wide-ranging review of the 'war on expertise', Klein and colleagues (2019) identify a current trend to discredit and mistrust experts, particularly those in scientific and economic fields. One source of rejection stems from the availability of vast amounts of information on the Internet, enabling 'armchair experts' to gain a broad understanding of a topic area, leading to an overestimation of lay knowledge. Intentional attacks have also occurred, whether from expertise-deniers such as conspiracy theorists, or those engaging in 'groupthink', with 'echo chambers' leading to circumscribed thought patterns and experiences.

6.2 Performance enhancement: how far is too far?

Research on performance enhancement in the field of sports and exercise has been extensive, largely focusing upon the use of banned substances or the many behavioural and cognitive approaches outlined in Chapter 15, which aim to optimize an athlete's mental and physical readiness for competition. By contrast, Chapter 16 focuses in particular on enhancements to the cognitive functioning of an individual, or their ability to deliver a fine-tuned motor performance requiring high levels of cognitive control. Cognitive enhancement is commonly defined as "interventions in humans that aim to improve mental functioning beyond what is necessary to sustain or restore good health" (e.g. Dresler et al., 2019, p.1138). Readers are invited to consider whether there is a sliding scale of acceptability, depending upon whether the enhancement is intended to address performance handicaps, uses conventional hard work to achieve gradual improvement, or involves rapid and fundamental alterations to cognition through exotic stimulation, be it pharmaceutical or

neuroscientific. A range of illustrative strategies within each of these categories are reviewed, ranging from the relatively uncontroversial (such as sleep and exercise) through to brain stimulation, using transcranial electrical stimulation or drugs. The psychological implications of more exotic performance enhancements - such as reduced resilience, motivation, self-efficacy, and authenticity - are considered throughout. Important questions are also raised about the underlying drivers of the enhancement (Is it truly necessary, or merely desirable, akin to cosmetic surgery? Is it for the good of the human, or for business efficiency?). Similarly, ethical concerns about 'hacking the brain' - such as risks, side-effects, loss of autonomy, and fairness - are also discussed.

6.3 Replacing the human?

The final twist in the exploration of 'performance enhancement' is to explore whether human experts will ultimately be needed at all. With the rapid advancement of AI, questions about the future of human expertise have recently taken centre stage. Although AI has not yet reached the level of 'Artificial Super-Intelligence,' capable of surpassing human intellect and abilities, specialist AI applications are already profoundly influencing a wide range of expertise domains, with their impact accelerating rapidly. Chapter 16 defines and explains a range of AI approaches, including optimization algorithms (e.g. chess programs), supervised learning (e.g. medical imaging, face detection), unsupervised learning (e.g. biological data analysis), and GPT systems such as art, text and music generators. Given the speed, scale, and personalisation capabilities of AI (particularly the GPT tools), there are understandable concerns that it may become a quicker and cheaper way to outsource creative production (for example, digital images, film actors, music tracks, and art works) than employing a real expert. One of the greatest threats to those with considerable talent

and knowledge in a particular field is thus the 'democratization' and down-skilling of tasks previously reserved for experts. Whether we will see a switch towards 'prompt engineers' (those skilled at specifying crafted prompts), and away from those with actual artistic and technical flair and know-how, may be determined by economic considerations such as corporate profit. The book suggests that while little-c (Apprentice) hobbyists, such as weekend watercolourists, may be relatively unaffected, and Big-C (Master) practitioners may be able to trade on their name for survival, it is those at a Pro-c level (Journeyman/Expert) who may be most at risk.

The discussion broadens into an exploration of 'pseudocreativity,' inviting readers to question whether AI can achieve true creativity or remains constrained by a lack of intentionality, derivativeness, authenticity, and a tendency towards regression to the ordinary. For example, without conscious understanding, current AI cannot intentionally invent, with humans being required to spot the serendipitous discovery, new connection, or particularly aesthetic combination. Furthermore, GPT systems operate by repurposing existing material, predicting the 'most likely' sequence. Given this underlying mechanism, its operation is argued to be entirely antithetical to most creativity challenges that demand 'remote associations' or 'unusual uses'. In fact, the goal of generative deep learning is to create synthetic outputs that closely mimic existing models, leading many (e.g. Runco, 2023) to suggest that outputs can only ever achieve "statistical pastiche plus statistical panache" (Lachman, 2023, para 4). Critics also argue that GPT lacks authenticity, as it has no self, lived experiences, emotional depth, or social intelligence. These limitations constrain its ability to genuinely convey values, emotions, or beliefs. Yet the drive for automation and corporate profit raises concerns that 'good-enough' performance may suffice in many commercial

contexts. Ultimately, public demand for authenticity and human involvement may determine the extent to which AI supplants human expertise.

7. The textbook as learning resource

Research into expertise development has expanded dramatically since Ericsson and colleagues published their first handbook in 2006. This handbook sold over 10,000 copies, and was responsible for a surge in interest in the domain, leading to a plethora of scholarly articles, popular psychology books and edited handbooks. Nevertheless, discussion of expertise at undergraduate level is often relegated to a single chapter in Cognitive Psychology or Sports and Exercise Psychology textbooks, reflecting a lack of comprehensive resources tailored to this domain. An authoritative and engaging textbook is now timely, offering undergraduate and postgraduate students, as well as early-career researchers across many disciplines, a structured entry into this dynamic field.

As one of the book's primary aims is to serve as a teaching resource for final-year undergraduate and postgraduate students, it incorporates a number of student-focused features. Each chapter begins with a summary of learning objectives and concludes with a recap of knowledge covered. 'Challenge questions' accompany each chapter, designed for individual self-assessment or as prompts for group discussion in more formal settings. A particularly engaging feature of the book is the inclusion of themed boxes that add lighter yet thought-provoking content. These boxes have been especially well-received by students, who appreciated their ability to connect theoretical content to real-world phenomena, inviting students to debate, pose questions, and explore topics not extensively covered in the applied chapters. The topics are deliberately diverse, showcasing the richness and

versatility of expertise as a field of study. They touch on subjects such as the challenge of stereotyping in acting ('"I am not Spock": conflation and typecasting,' Box 8.4), the tension between creativity, authenticity, and imitation ('Can fan fiction be creative?' Box 9.2; 'Spin-off or spin-art? Can forgery be creative?' Box 10.3), and the fascinating interplay of perception and imagination ('The canvas of the mind - The blaze of synaesthesia and the blank of aphantasia,' Box 12.3). Topics such as 'Pirouettes - How do dancers spin without getting dizzy?' (Box 7.2), the reluctance of pop stars to stay in retirement (Box 13.2), and 'Rapping as lyrical improvisation' (Box 9.3) proved to be especially popular, encouraging students to connect their own experiences and interests with the study of expertise.

Chapter 2 also provides a technical grounding in the broad range of research approaches used within the expertise field. Building on Chapter 1's discussion of expertise, this chapter examines how to benchmark expertise levels in research samples using performance- or reputation-based metrics. It also emphasises the importance of selecting an appropriate sample to align with the research design. After establishing how to define and measure expertise, the chapter shifts to examining the approaches commonly used to study it, providing an overview of quantitative, qualitative, and historiometric methodologies - including Ericsson's Expert Performance Approach (2007). Readers are directed to edited handbook resources for more detailed guidance. The chapter concludes with a critical discussion of persistent challenges in expertise research, such as the stagnation of research designs, the risks of 'a priori' assumptions about the skills needed for excellence, the narrow focus on a limited range of domains, and the need to explore a broader spectrum of potential influences consistent with a multifactorial perspective. The 'Grounded Expertise Components Approach' (Friedlander & Fine, 2016) is explored as a

potential way to overcome these issues.

8. Concluding thoughts

Difficult decisions had to be made about what to include and what to leave out, given the constraints of word count and the need to create a manageable resource for students and newcomers to the field. Inevitably, there will be omissions that some deeply immersed in the field may find regrettable. However, I hope this textbook achieves its primary aim: to spark enthusiasm for the study of expertise in general, and the creative performance fields in particular. These goals will have been achieved if it provides a clear entry point into the domain, while signposting further resources for deeper exploration. I am particularly grateful to the students in my Creative Performance and Expertise modules of Spring 2022 and 2023, who piloted many chapters and provided invaluable and enthusiastic feedback.

Above all, my goal has been to craft a book that conveys the joy and excitement I derive from working in this field. In writing it, I have worked to synthesise diverse resources across less familiar fields, and I have charted skills models in areas such as music, dance, theatre, and creative writing that may serve as a launchpad for others to build upon. I hope this inspires both new and established scholars to venture into less-charted territory, guided by the skills frameworks and literature now gathered in one place. Additionally, I have sought to challenge traditional ideas about the relationship between expertise and creativity, expanding the conversation to consider the roles of aesthetic response, environmental sensitivity, and imagination in expert creative production. Ultimately, I hope this book deepens understanding and sparks fresh interdisciplinary research into the

958 multifaceted drivers of expertise, moving beyond simplistic ‘born vs. made’ debates toward
959 a richer, more nuanced exploration of this fascinating domain.

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