Mastermind and Expert Mind: A Qualitative Study of Elite Quizzers

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Abstract

Quizzing is an enduringly popular pastime, yet quiz has received little attention in the expertise literature. Some elite quizzers stand out even among their peers, leading us to ask how expert quizzers develop their prodigious knowledge. Quizzing takes many forms, including general knowledge quizzes, websites such as *Sporcle*, games like *Trivial Pursuit*, and broadcast quiz shows, suggesting that the cognitive and motivational drivers of quiz excellence may be multifaceted and vary according to challenge. We investigated this domain using the Grounded Expertise Components Approach (GECA), which starts by characterizing those active in a domain through a broad survey. In order to scope out the areas such a survey should cover, qualitative semi-structured interviews were conducted with seven expert quizzers, either winners of UK TV shows or professional quiz setters. Data were analyzed using inductive thematic analysis. Seven themes were generated, six of which are discussed in this paper. "Levels of Expertise" provided support for a range of performance levels within quiz, with suggestions as to how to benchmark these levels, as well as discussing gender inequalities in the domain. "Thirst for Knowledge" related to an enthusiastic interest in facts, with a corresponding sponge-like ability to acquire incidental information driven by curiosity and engagement, and an appetite for cognitive challenge. By contrast, "Quiz Preparation" explored the use of deliberate (and/or purposeful) practice to plug gaps in knowledge. "Immersion" reflected the continued engagement in quiz which kept the quizzers at the top of their game. "Motivation" discussed the intrinsic and extrinsic motivational drivers for both starting quizzing and then maintaining a high level of involvement. Finally, "Characteristics" related to how individual differences in the patterns of cognitive and other traits may underlie quiz preferences. The findings informed the construction of a Stage 1 GECA survey of quizzers (results to be reported elsewhere), as well as signaling some of the most important underlying cognitive and motivational factors involved in the development of quiz expertise.

Keywords

expertise, quiz, elite quizzers, GECA, knowledge, semantic memory, cognitive skills, deliberate practice, purposeful practice, qualitative design

Introduction

Who won the Oscar for Best Actress in 2000? On the border of which two countries would you find the Victoria Falls? What links Tuscany, one of a quartet of superhero shelled reptiles, and the ceiling of a certain chapel in the Vatican?[1] These and countless similar questions are staples of quiz.

Participating in quiz has been a popular pastime for many decades (Connor, 2016; Welch, 1958) and takes various forms, including general knowledge quizzes in newspapers and magazines, pub quizzes and trivia contests, board games such as *Trivial Pursuit*, and a myriad of broadcast quiz shows, firstly on radio

and television from the 1940s onwards (Whannel, 1992), and now online. Indeed, the popularity of quiz grew considerably during the Covid-19 pandemic (Golby, 2020; *QuizQuizQuiz*, 2020; Rinaldi, 2020) as it became one of the few group pastimes possible during lockdown using apps and websites such as *Kahoot!*, *QuizUp*, *Psych!*, and *Sporcle* (Roberts, 2021; https://www.sporcle.com). As well as being a popular pastime for the masses, quiz is also a domain in which a small proportion of people excel: expert quizzers. Despite this, the world of quiz has received very little attention in the expertise literature: The present article seeks to address this research gap.

Expertise Research - Aims and Issues

Expertise is the domain-specific ability to repeatedly and reliably demonstrate performance levels superior to most others active in the domain, on the basis of superior skill-sets, knowledge or abilities, whether cognitive or physical (Ericsson & Towne, 2010; Gobet, 2015). This implies a spectrum of performance levels, with experts towards the top end. Additionally, a small proportion of "super-experts", who stand out even among their expert peers, have been identified in various domains, such as Magnus Carlsen in chess (Gobet & Ereku, 2014), Nigel Richards in Scrabble (Hambrick, 2015), Mark Goodliffe in cryptic crossword solving (Connor, 2014; Friedlander & Fine, 2016), and Kevin Ashman and Olav Bjortomt in quiz (Connor, 2016; Waley-Cohen, 2019). In Hoffman's taxonomy of proficiency levels (Novice, Initiate, Apprentice, Journeyman, Expert, Master), super-experts are equivalent to his Master level (Hambrick & Hoffman, 2016; Hoffman, 1998, 2017).

Much psychological research has investigated why only a proportion of those active in a certain domain achieve expert levels of performance, with one of the most prominent debates relating to the roles of experience and the environment versus the importance of innate abilities (Hambrick et al., 2016; Ullén et al., 2015). This debate partly reflects the research

question under investigation. Those researching how expertise develops in general tend to focus on deliberate practice (DP), the unenjoyable, tedious, structured, private rehearsal of domain-specific skills leading to improved ability (Ericsson et al., 1993; Ericsson & Towne, 2010; Howe et al., 1998; but see Hambrick et al., 2020 and the discussion below in Theme 3). Conversely, those investigating individual differences in performance (for instance, comparing Masters and Experts with Journeymen) tend to follow a multifactorial approach, such as that set out in the Multifactorial Gene-Environment Interaction Model (Ullén et al., 2015). This approach suggests that domain excellence is driven by a blend of innate cognitive abilities, together with other factors related to the environment, motivation, and practice, the latter being but one ingredient of expertise, often necessary but not sufficient (Campitelli & Gobet, 2011; Hambrick et al., 2016; Macnamara et al., 2014, 2018; Meinz & Hambrick, 2010; Ullén et al., 2015).

Accordingly, expertise research tends to address three main questions. First, it elucidates the psychological mechanisms whereby certain individuals develop superior skills-sets, knowledge, or abilities in comparison to others active in that domain (Ericsson & Towne, 2010; Hambrick et al., 2016). Second, it explores the individual characteristics which distinguish experts from non-experts (Friedlander & Fine, 2016; Ullén et al., 2015). Third, it investigates those truly exceptional, elite performers in a domain: Hoffman's Masters (Chi, 2006; Hoffman, 2017).

Most expert development research centers around a small number of domains, notably chess, music performance, sport, and Scrabble, but this approach can be problematic (Friedlander & Fine, 2016, 2020; Hambrick et al., 2020). It is likely that there are fundamental differences in both the mechanisms of expertise development and the characteristics of experts between other more niche fields and these more highly researched domains. Indeed, DP has been demonstrated to be pivotal in the development of chess, music, and Scrabble expertise (Charness et al., 2005; Ericsson et al., 1993;

Howard, 2009, 2012; Schmidt et al., 2021; Tuffiash et al., 2007), but not in all domains. For example, both synonym-only and cryptic crossword Experts and Masters effectively do no DP, instead relying on the experience of solving crosswords to develop expertise (Friedlander & Fine, 2016; Toma et al., 2014), which may be more closely aligned with the concept of deliberate play (see Theme 3 below for further discussion: Côté et al., 2007). Another domain-related difference is starting age: Elite musicians and grandmaster chess players usually become active in the domain at an early age, but again this is not the case for expert cryptic crossword solvers or Scrabble players, who only tend to start solving or playing seriously in their mid to late teens (Friedlander, 2024; Friedlander & Fine, 2016).

For these reasons, it is important to expand our understanding of expertise into other less familiar areas, pursued out of the limelight of intense competition (Friedlander & Fine, 2020; Hambrick et al., 2020). In this paper, we set out our initial explorations of the field of quiz, a relatively unexplored domain.

What is Quiz?

Although the domain of quiz has not been the subject of much scholarly research, it clearly qualifies as an expertise area. Quiz as an activity has been defined as "competing to answer factual questions for enjoyment" (Connor, 2016, p. 3). It can thus be considered a question-and-answer mind game, involving a fixed set of rules, a known structure, an element of artificial conflict, and a quantifiable outcome (Gobet et al., 2004; Salen & Zimmerman, 2003), although the precise structure and rules will differ between quiz formats.

Quiz is very popular, with many people quizzing on a regular basis. The British are particularly enthusiastic quizzers, with a 2016 survey finding that at least 81% of respondents watched quiz on television, listened on the radio, or actively took part in various formats, and that 44% did so at least once a week (Connor, 2016). Given the recent Covid-19 pandemic and associated lockdown, these figures may have risen in the last few years. Globally, as of

July 2024, over 5.6 billion quizzes have been completed on *Sporcle* in the 17 years since its creation (www.sporcle.com/stats/). In addition to its being an enjoyable pastime, quiz is also commonly used as a pedagogical technique, for example using the educational platform *Kahoot!* (https://kahoot.com/).

Quiz encompasses a plethora of formats, types and levels, implying the existence of a broad range of quiz-related challenge. The basic requirement in all quizzes is for contestants to answer explicit factual questions posed by the quiz setter, often of the form Who/When/What/Where. It is thus a test of personally held semantic knowledge: The quizzer is expected not to go and look the answer up, commonly considered an example of cheating. The specific quiz format can differ in various ways. For instance, where quizzing takes place in a social or public setting, contestants will usually be vying against one another (e.g., *Trivial Pursuit*, pub quizzes, quiz leagues, and many televised quiz shows) or against seasoned professional quizzers (such as *The Chase* and *Eggheads*[2] on UK television), with the aim of beating some or all of the opponents. On the other hand, some personal/solo quiz formats may be conceptualized more as a conflict between setter and contestant, whereby the contestant pits their wits against the setter's challenges while perhaps aiming to achieve a personal best time or score (Connor, 2016; Salen & Zimmerman, 2003). In this latter format, quizzes may be compared to cryptic crosswords, where the solver and setter are effectively opponents trying to better each other (Friedlander & Fine, 2016).

Some formats are more sociable than others, the pub quiz being one of the most recognizable examples. Here, teams or occasionally individuals meet regularly and answer factual questions, often organized into multiple rounds, with the aim of winning. Similarly, *Trivial Pursuit* tends to be played by up to six people or teams, using a large, fixed bank of factual questions: Individuals would rarely play *Trivial Pursuit* by themselves. Quizzes broadcast on television or radio may have the additional social aspect of live spectators, who may

themselves have a role as active participants, such as "asking the audience" in *Who Wants to be a Millionaire?*.

Quiz also provides different levels of challenge ranging from casual family games such as *Trivial Pursuit* which are played occasionally, through regular pub quizzes and organized quiz leagues, to participating in national televised (or radio) quiz shows, which are broadcast on a regular basis (Connor, 2016). For serious quizzers, quiz leagues offer competitive opportunities at national, European, and global levels. The challenge and level of knowledge required tend to increase towards the higher echelons of quiz, with UK television programs such as *Mastermind* (on which see further below) being considered the pinnacle by some (Goodhart, 2022). The wide range of backgrounds of television quiz competitors, even at a high level, suggest that quiz is potentially accessible to anyone, without the financial burdens inherent in serious engagement with certain other domains, such as music performance and many sports. High level quizzing also allows for the existence of elite quizzers—Masters—in the domain: The Chasers on *The Chase* and the Eggheads on *Eggheads* are obvious examples.

The challenges involved in different types of quiz vary widely, and these might appeal to different quizzers and involve different cognitive demands, as discussed later. For instance, quizzers who favor general knowledge may play *Trivial Pursuit*, or take part in pub quizzes and *The Chase*. Those who enjoy specialist knowledge quizzes may apply to be on *Mastermind* or choose particular quizzes on websites such as *Sporcle*. An alternative type of quiz emphasizes lateral thinking and connection making over and above the recollection of semantic knowledge. For instance, *Only Connect* (BBC television) and *Round Britain Quiz* (BBC radio), both involve answering questions such as the third question at the start of this article, of the form "What links…?"

Quiz types also differ in other ways not relating to the nature of the questions asked. For instance, some quizzes are strictly time-limited, such as *The Chase* and *Only Connect*, where a countdown timer determines the deadline for answering each question, or *Mastermind*, where two minutes are available to answer as many questions as possible. Yet other quizzes involve contestants racing against each other, rather than the clock, in order to press a buzzer before their opponents and be allowed to answer. This then becomes partly a reaction-time task, an example being *University Challenge* on BBC television, which pits two student teams of four players representing their university against each other.

Quiz is thus a sphere whose participants encompass a wide range of levels of engagement, experience, and performance. Given its broad variety of formats, types, and levels of challenge, quiz has the potential to provide a rich source of performance data to address questions concerning the development and characteristics of quiz expertise.

Hypothesized Characteristics of Quizzers

We can therefore ask what type of characteristics we might expect quizzers to possess. Given the broad panoply of quiz formats and types, as well as a range of ability levels, it would not be surprising to find individual differences in the specifics of these characteristics. However, we can suggest various cognitive, motivational, and environmental characteristics which might be common among quizzers, across the range of levels of proficiency from Novice to Master, and particularly among those who achieve greater success in the field.

Memory

One of the most important attributes for quizzers to possess is a good semantic memory, the basic currency for all quiz, and we would expect more proficient quizzers to have better semantic knowledge. Across previous research into expert memory, one important but under-researched question concerns individual differences in people's ability to encode, store, retrieve, and apply episodic and semantic information when required (Wilding, 2013). Possessing highly detailed and well-organized

factual knowledge structures allows new information to be filed away efficiently, facilitating subsequent recall (Hambrick & Hoffman, 2016; Sternberg & Sternberg, 2011). This has been termed the "skill-by-structure" account of expertise (Lehmann et al., 2018) and relates to the possession of an "architectonic" understanding of a domain (Friedlander, 2024). A more extensive and organized knowledge base together with more efficient search and recall strategies would thus be expected to lead to greater expertise in quiz. Indeed, Hambrick and Hoffman (2016) describe an expert as someone who "shows consummate skill and economy of effort" while "possess[ing] knowledge that is fine grained, detailed and highly organized" (p.53), and we can see how this could be applied to quiz.

As already discussed, a much-cited technique for laying down and strengthening memories is DP. As an ingredient of expertise development, DP has been shown to be important in accruing semantic memories of both an embellished and a lean nature, depending on the specific domain (Friedlander, 2024). Examples of embellished semantic memory traces established through DP include over 50,000 chess positions by Grand Masters (Campitelli, 2017), and London's 25,000 streets by taxi drivers who have acquired "The Knowledge" (Woollett et al., 2009). Such memories tend to be organized into strongly interconnected richly detailed "templates" of associated data (Gobet & Simon, 1996), hence the label "embellished".

On the other hand, "lean" semantic memory traces acquired through DP, although still purposeful and meaningful, may not involve the same depth of processing in their creation, and, though still organized, are likely to be somewhat less richly interconnected (Friedlander, 2024). For example, Scrabble experts use alphagrams (alphabetized strings of 3 to 8 letters together with their valid lexical anagrams) to learn the official list of over 260,000 British English words (Williams, 2015). The use of the alphagram structure will facilitate encoding, storage, and rapid retrieval. However, although top Scrabble experts will learn the complete list,

there is little effort to enrich the alphagrams with word meanings, as these are not relevant to competitive Scrabble play (Friedlander, 2024; Mueller, 2019; Tuffiash et al., 2007). Similarly, the US-based "Scripps National Spelling Bee" competition used to rely purely on rote-learning the orthography of deliberately obscure words without reference to their meanings (Duckworth et al., 2011), although word meaning rounds have been incorporated into the Spelling Bee since 2013 (https://spellingbee.com; Zimmer, 2013).

The above examples all involve the application of an effortful DP regime in order to acquire high-level specialist, domain-specific knowledge. However, such DP regimes are not always necessary, and experts in various domains have demonstrated enhanced incidental learning of specialist material, without the need for effortful study (Friedlander, 2024). For example, expert crossword solvers, both definitional and cryptic, do not seem to engage in any forms of DP over and above their day-to-day solving of crosswords (Friedlander & Fine, 2016; Mueller, 2019; Toma et al., 2014). Wine-tasting and beer-tasting experts appear to rely far more on years of experience than on formal training in developing their olfactory and gustatory discrimination sensitivity, as well as (for wine-tasters) domain-specific conceptual information, for instance relating to grape varieties (Spence & Wang, 2019; Van Doorn et al., 2019). In similar fashion, a passionate interest in, say, a particular sport may lead to an expert knowledge of scores, players, and statistics from top sporting leagues merely through exposure to the field (De Beni et al., 2007). Foer (2012) described memory as "a spiderweb that catches new information. The more it catches, the bigger it grows. And the bigger it grows, the more it catches" (p.210). From this it follows that having both an existing organized domain-specific knowledge base and an active interest in that domain can lead to rapid growth of knowledge. Thus, domain-specific knowledge has been shown in some areas to be accrued simply through incidental exposure to information in the relevant domain (Friedlander, 2024).

An additional issue concerns the breadth of this domain-specific knowledge. Whether the relevant material is learned as a result of DP or passively absorbed, most domains that lend themselves to expert performance tend to involve a rather circumscribed body of knowledge (Chi, 2006). Examples include chess moves and strategies (Gobet, 2015) and Scrabble alphagrams (Tuffiash et al., 2007). As Lewandowsky and colleagues (2007) comment, "It should come as no surprise that expert archaeologists are not necessarily also outstanding oceanographers, and that expert psychologists are unlikely also to be world-class ornithologists" (p. 86). However, other than in a small number of quiz formats and shows—such as the specialist subject round in *Mastermind*—the main domain that expert quizzers excel in is that of general knowledge (Maylor, 1994), whether high-brow (e.g., classical music, science, art) or low-brow (ephemeral, pop culture facts, such as Wimbledon winners, Oscar nominee first names, or the list of celebrities who have been on *Strictly Come Dancing* on BBC television). For such a broad knowledge domain, encompassing pretty much any factual information, it is unclear how expert quizzers could target their DP to learning facts: Which facts should they concentrate on, given that almost anything could come up on the day?

For this reason, we hypothesize that semantic memory for quiz is likely to tend towards embellished, rather than lean, stored together with contextual meanings and associations in an organized manner. Both encoding and recall are important skills in high level quizzing: not just knowing the answer but being able to locate and verify it. We would expect those with expert memories to be more efficient at both encoding new material and recalling it when required, but the question is wide open as to whether such memories in quizzers are laid down by DP or through passive absorption of information. We can therefore also ask whether naturally good memorizers exist in quiz, for whom deliberate study might be less important.

Other Cognitive Skills

Knowing a great deal is clearly central to successful quiz performance. However, according to Maylor (1994), excelling in general knowledge quizzes requires, in addition to an excellent knowledge base, efficient encoding and recall, swift decision-making as to the correctness of the answer, and the ability to resolve tip-of-the-tongue moments. This involves a number of cognitive abilities, which we discuss with reference to the Cattell-Horn-Carroll model of intelligence (McGrew, 2009). This model splits general intelligence g into 16 broad ability domains, on the basis of which various psychometric tests can uncover differences between individuals. Of particular relevance here are Gc (comprehension knowledge), Glr (long term storage and retrieval), and Gt (reaction and decision speed).

Gc is a measure of what someone knows, acquired through education, enculturation, and experience, both in terms of semantic and procedural knowledge, and some such knowledge is likely to be relatively universal among a particular culture—termed K0 (general verbal knowledge). Also related to Gc, Gkn (general domain-specific knowledge) is a measure of the scope and mastery of acquired knowledge in specific domains; unlike K0, Gkn is more likely to comprise information known only by certain people (McGrew, 2009). A higher Gc, Gkn, and K0 are all likely to imply a more extensive knowledge base, and K0 might be expected to be particularly important for quiz given its emphasis on general knowledge, as noted above (Friedlander, 2024; Maylor, 1994), whereas Gkn is perhaps more relevant for specialist quizzes, such as on *Mastermind*.

Glr relates to both the initial consolidation and storage of new knowledge, and the later retrieval of pertinent information when needed. As already noted, it is not just the ease with which new information is stored that is relevant to quiz performance, but also the ability to locate and retrieve appropriate information efficiently when required (Maylor, 1994). The tip-of-the-tongue phenomenon, where the individual knows the answer and may even have some orthographic knowledge (number of

syllables, starting letter) but cannot recall the word itself, may also relate to Glr (Newton & McGrew, 2010). Resolving tip-of-the-tongue moments is more difficult when being observed and evaluated, often a characteristic of quiz, particularly at higher levels (James, 2018), and such word finding difficulties are clearly detrimental to successful quiz performance. We might expect an individual with a higher Glr to be more efficient at storing new information, identifying and retrieving it when required, and resolving tip-of-the-tongue moments.

Gt pertains to how swiftly an individual responds to stimuli and makes decisions, including semantic processing speed (McGrew, 2009). When answering quiz questions, in addition to knowing the correct answer and being able to locate it in long-term memory (LTM), the quizzer must determine whether it is in fact the right answer to the question being asked. Retrieving a possible answer swiftly but not being able to verify its correctness may lead either to wrong answers or increased decision time, problematic in cases where only the quickest contestant to buzz can answer. We might expect those with higher Gt to be faster at selecting from various options in LTM and also more assured at deciding which one to plump for.

A further aspect of certain quiz formats, already alluded to above, is the need for speed. In buzzer quizzes such as *University Challenge*, the first contestant to answer correctly secures the next three follow-on questions for their team rather than for their opponents. Although Gt is important in deciding what the correct answer is, Gs (cognitive processing speed) and Gps (psychomotor speed) may both influence how quickly a contestant can press the buzzer. For straightforward questions to which most contestants would be expected to know the answers, this processing and button-pressing rapidity may be important in determining who buzzes first.

Finally, certain quizzes such as *Only Connect* and *Round Britain Quiz* involve additional cognitive tasks: They require contestants first to work out the answers to factual questions and then to determine what

their connection is, such as the third example at the start of this article. This supplementary component tends to be more puzzle-like in nature, often requiring lateral thinking and potentially frame-breaking: For instance, certain terms may need to be interpreted in a less obvious way.[3] Such lateral thinking tends to involve Gf (fluid intelligence), the deliberate use of cognitive effort to solve novel problems, reason, and draw inferences: "thinking on one's feet" (Friedlander & Fine, 2020; McGrew, 2009). For some such questions, Gsm (short-term memory) and in particular the use of working memory (WM) together with certain other executive functions (EF) may be important in maintaining a limited amount of information in consciousness to facilitate complex cognition. For example, answering a quiz question of this type may involve monitoring where in a sequence one has reached, inhibiting wrong but speciously attractive connections, switching electively between convergent and divergent idea generation to broaden and narrow down potential solutions, or holding multiple pieces of information in mind simultaneously. People differ in working memory capacity (WMC: Shipstead et al., 2016), and a larger WMC and stronger Gsm might be expected to give some quizzers an advantage, as least for certain quiz types.

Thus, in addition to an extensive knowledge base (high Gc, Gkn and K0), other cognitive skills are likely to be important in differentiating between quizzers of different standards, including those related to retrieval efficiency, processing and decision speed, lateral thinking, and WM. Indeed, in the realms of both definitional crosswords and quizzing, expertise is supported by the initial encoding of material into robust knowledge structures, efficient memory search from remote cues, and reduced interference by irrelevant information, so it is perhaps unsurprising that Mueller (2019) observed an overlap in the two expert populations in the US.

Other Motivational Drivers

In addition to the cognitive skills discussed above, other key motivational drivers are likely

to be involved in the pursuit of quiz. Individual differences in such factors will potentially affect both initial involvement and continued engagement with quiz, as well as contributing to the development of quiz expertise and influencing the ultimate expertise level reached, whether Journeyman, Expert, or Master.

Both intrinsic and extrinsic motivational drivers can influence the pursuit of any activity. The Workplace Preference Inventory (WPI), an instrument designed to assess individual motivational orientation (Amabile et al., 1994), comprises four factors: Enjoyment and Challenge (intrinsic factors) and Outward and Compensation (extrinsic factors). We might hypothesise that all four have potential relevance to quizzing: High level engagement with quiz can be very time consuming, and a lack of enjoyment and positive reinforcement would soon be expected to lead to abandoning quizzing.

Intrinsic drivers for engagement with quiz may include the enjoyment and satisfaction of correctly answering a tough question, winning a particular quiz, beating one's own personal score, or just putting one's existing knowledge and memory to good use (Connor, 2016). The success of winning and associated feelings of achievement and glory can be highly rewarding and thus strong motivators for continuing quizzing. Quiz also provides a valuable opportunity to increase one's knowledge by learning from incorrect answers, and this is likely to be an important motivational driver particularly for those with a high Need for Cognition (NfC), an investment trait relating to seeking out, engaging in, and enjoying effortful thinking (Cacioppo et al., 1984; Furnham & Thorne, 2013). NfC also relates to curiosity and drives thirst for knowledge, important in accruing semantic facts, suggesting that expert quizzers might be expected to score high in this trait.

One question concerning motivation for quizzing relates to formative childhood experiences and the age at which quizzers start quizzing seriously. In certain expertise domains, such as chess (Gobet & Campitelli, 2007) and some genres of music, including classical violin

and piano (Lehmann et al., 2018), expert performers tend to begin early in life, arguably in order to fit in the 10 years or "10,000 hours" of DP required (Ericsson & Ward, 2007). Starting young may also facilitate quicker expertise development through enhanced neuroplasticity at an early age (Herholz & Zatorre, 2012), and parents or siblings who are already musicians or chess masters, for instance, might encourage and support younger children both to start and then to maintain the rigorous schedule of DP required. Indeed, there are well-known examples of prodigies in both chess, such as the Polgár sisters (Howard, 2011), and in music, including violinist Sarah Chang, drummer Igor Falecki, and Mozart (Dalla Bella et al., 2016; Gagné & McPherson, 2016), all of whom started seriously by the age of about five.

However, this is not always the case: In certain mind game domains, experts tend to begin engaging seriously rather later, in adolescence or even adulthood (Friedlander, 2024). Cryptic crossword solvers generally start seriously in their mid to late teens, with elite Master solvers starting at about age 15 on average (Friedlander & Fine, 2016), and top-flight Scrabble players start in their late teens or even their twenties (Friedlander, 2024). There tend to be few (if any) reports of prodigies in these domains, and quiz prodigies appear to be equally rare, although see the case of Michael Kearney (Friedlander, 2024, Box 5.2; Morelock, 2013). Similarly, crosswords and Scrabble may be family activities, but parents are probably less likely to push children to excel in these fields, compared to other high-profile performance areas such as chess, dance, sport, gymnastics, and music, which seem to promote "concerted cultivation" parenting styles (Wheeler & Green, 2019; Friedlander, 2024). Crosswords and sudoku also appear to be mind-game domains where DP has been demonstrated as being less important (Friedlander, 2024, Figure 4.4). It is thus an open question whether quizzers tend to start early (as for chess) or later (as for cryptic crossword solving), and also the extent to which the family environment and childhood experiences are important factors in both taking up and maintaining engagement with quiz.

The social aspects involved in seeking out activities with likeminded others may be another key driver for quizzing. With the exception of solo quizzing online on sites such as *Sporcle* or browsing through quiz books, quizzing is largely a sociable activity, involving multiple people, whether collaborative (on the same team) or competitive. For instance, pub quizzes can be highly sociable events, more often than not accompanied by alcohol, and this could be a strong intrinsic motivator for some.

Competitiveness may also drive participation in some quiz formats, particularly for those at higher performance levels. This competitiveness may take various forms. Related to Amabile's Challenge factor, quizzers may compete with themselves, for instance to improve their personal best time or high score, or to secure a new achievement such as moving up a quiz league level (Connor, 2016). As noted earlier, some quizzes can be conceptualized as a contest between the setter and the contestant, again potentially leading to a sense of competitiveness. Finally, interpersonal competition against other contestants is a staple of many quiz formats, from *Trivial Pursuit* to pub quizzes to broadcast quizzes and quiz leagues, and is particularly important at the higher echelons of quizzing. This too can be conceptualized as an intrinsic motive through the sense of satisfaction achieved in getting to the answer first, although there may also be an aspect of extrinsic motivation in being seen to win.

Extrinsic motivational drivers relate both to reputational gains (Outward) and material gains (Compensation). Gaining recognition and respect from one's peers as well as broader public acclaim through demonstrating one's quizzing skill and achievements in competitions and broadcast quiz shows may be a strong motivator, and this is likely to be particularly true for well-known elite quizzers such as Kevin Ashman and the professional Chasers. Material rewards such as trophies or modest financial prizes are common in quiz leagues and pub quizzes, though the extrinsic financial rewards offered on some televised quiz programmes can be extremely high, for example up to a million pounds in the UK version of *Who Wants to be a Millionaire?* We might thus expect extrinsic motivation to become more important in more serious quizzing.

Grounded Expertise Components Approach

A key limitation in expertise research is the lack of in-depth knowledge of the population active in a particular domain (Friedlander & Fine, 2016). This, together with the researchers' ideological stance on the roles of innate abilities versus environmental and experiential factors, such as DP, can lead to preconceived assumptions about possible drivers of expertise (Friedlander & Fine, 2020). Friedlander and Fine (2020) discuss the pertinent example of research into Scrabble expertise (Tuffiash et al., 2007), which demonstrated superior next-move selection and verbal task performance in experts compared to less expert players. However, Tuffiash and colleagues did not consider the relevance of strategic and mathematical thinking in Scrabble by investigating fluid intelligence (Gf), despite the importance ascribed to these abilities by elite Scrabble players themselves (Friedlander & Fine, 2020; Katz-Brown, 2006).

To address these issues, Friedlander and Fine (2016, 2018, 2020) developed the Grounded Expertise Components Approach (GECA), emphasizing the importance of characterizing the population active in a domain, from relative Novice to Master, across a broad range of dimensions. The first stage of the GECA methodology therefore commences with a wide-ranging survey, which, while not prescriptive, might include areas such as motivational drivers, levels of engagement and experience in the domain, as well as both core (age, gender) and more peripheral (education, occupation, hobbies) demographic variables, aligning with a multifactorial approach to expertise (Friedlander, 2024). This guards against researchers making uninformed assumptions about the domain (such as starting age and levels of DP) without first verifying whether they are empirically valid (Hambrick et al., 2020). Testable hypotheses grounded in the domain population data can then be developed in the later stages of GECA, effectively guarding against confirmation bias.

Rationale and Aims

The above information points to various qualities or characteristics which quiz experts might reasonably be expected to possess and poses some important unresolved questions concerning the key elements of quiz expertise development. Such questions include how to objectively benchmark expertise levels within the domain, and how individual differences affect quiz performance. These differences potentially relate to the nature and extent of quiz preparation, such as practice regimes, together with the motivational drivers for quizzing, the influence of the childhood environment and early quizzing experiences, and key aptitudes, both cognitive and non-cognitive, which might lead to quizzing success.

The ultimate aim of this research program is to address these questions using the GECA approach (Friedlander & Fine, 2016), uncovering specific characteristics relating to Hoffmann's levels of proficiency, and enabling direct comparison of quizzers of different types and expertise levels. To this end, a broad-based quantitative survey of quizzers was planned as per Stage 1 of GECA (Friedlander & Fine, 2016). However, the lack of pre-existing research into quiz posed particular problems in implementing the GECA Stage 1 survey for this domain. Although the authors could certainly speculate about the likely cognitive demands of quiz, as outlined above, there was too little pre-existing information to ensure that the survey questions posed were both relevant and sufficiently broad, and, as already argued above, it

is also important to ensure that such a survey does not make biased *a priori* assumptions.

To address this, a fixed, exploratory, sequential mixed-methods design was used. This involves the initial collection of qualitative data in order to develop a subsequent planned quantitative stage (Creswell & Clark, 2017). In this study, a set of pre-GECA qualitative interviews were conducted with demonstrably expert quizzers in order to gain an in-depth understanding of the quiz population. The intention was to use the themes developed from the interviews to create a comprehensive GECA Stage 1 quantitative survey for subsequent dissemination to a large sample of quizzers of all expertise levels. The knowledge gleaned from these pre-GECA interviews is the subject of the current article: The results of the GECA Stage 1 survey will be reported elsewhere.

Method

Participants

A purposive sample of seven expert quizzers (two female, five male), all known personally either to the researchers or their immediate contacts, were approached on an individual basis, and all agreed to be interviewed. They were identified as appropriate for the study based on their extensive experience and high level of immersion in quizzing, whether as quiz contestants, setters, or both: Two were professional quiz setters and four had won broadcast media quiz shows. Their quiz achievements, as confirmed in the interviews, thus demonstrate a high level of expertise and are shown in Table 1.

Table 1. Gender and Quiz Achievements of the Interviewees

P	Gender	Achievements
1	Male	Winner on *Eggheads* with a team; regular pub quizzer.
2	Male	Winner on *Mastermind* and *Brain of Britain*; regular quizzer.
3	Female	Winner on *University Challenge* with a team; participant on *Only Connect*.
4	Male	Quiz setter/editor for TV programmes; author of popular work on quizzes.
5	Male	Winner on *Mastermind*; multiple TV contestant; regular quizzer.
6	Male	Professional quiz setter for pub quizzes.
7	Female	League player; multiple TV contestant.

Note. P = participant number

Measures

A semi-structured interview schedule (see Table B in the Appendix) was developed by drawing on material from non-peer-reviewed quiz-related sources, such as blogs, magazines, online forums, and popular books on quiz (Connor, 2016), as well as the expertise literature more broadly. The questions together with follow-up prompts covered each major topic area of interest, as discussed in the literature review above, and their open-ended nature ensured that the interviewees were not being led. As long as all topics were covered, the conversation was allowed to flow naturally, frequently departing from the set order of questions in the interview schedule. All interviews were recorded on a Sony digital recording device for subsequent transcription and analysis.

Procedure

Ethical approval, in accordance with British Psychological Society guidelines, was obtained from the researchers' institution. Mutually convenient interview times and locations, either in person ($n = 3$), over the phone ($n = 3$) or on Skype ($n = 1$), were agreed. The first author led all interviews, one of the other authors facilitating the introductions but otherwise taking a secondary role in the interview, only asking occasional follow-up questions. Once informed consent was obtained, demographics were noted down (name, achievements and gender) and the recording started. Using the semi-structured interview schedule as a guide, all topics were covered, with a final opportunity for the interviewees to add anything they did not think had been discussed. At the end of each interview, lasting from 30 to 55 minutes, the interviewee was verbally debriefed and thanked for their time. Although names were initially recorded for the purposes of verifying the achievements claimed, the interviewee identities remain anonymous, and quotations will be ascribed to their participant number P1-P7 as per Table 1.

Analysis

Interviews were transcribed by the first author and transcripts reviewed by all three authors. Using an essentialist/realist epistemological stance, inductive thematic analysis (Braun & Clarke, 2006) was used to interrogate the interview transcripts in order to capture the rich qualitative nature of the material and generate themes.

An important aspect of qualitative research is to acknowledge that researchers bring their own views and experiences to the conducting, analysis, and interpretation of interviews. As already stated, all but one of the interviewees were known to one of the authors, but always as an acquaintance rather than as a close friend, and the lead interviewer had not interacted with any of them previously. In terms of quiz experience, all authors watch broadcast quiz shows, and one author (PF) writes occasional pub quizzes and is fairly active on *Sporcle*, but none of us would self-describe as an expert quizzer. The latter two authors are cognitive psychologists, immersed in the expertise domain, and thus potentially bringing some preconceptions about the likely drivers of excellence. However, given our familiarity with GECA, too, we remained aware of the importance of being open to unexpected findings and avoiding presuppositions as much as possible (Friedlander & Fine, 2016).

Results
Themes Overview

In all, seven themes were generated (Braun & Clarke, 2019) from the interview material, as shown in Figure 1. Note that the light gray theme "What Makes a Good Quiz?" will not be discussed as it is not pertinent to the research questions under investigation ("what characterizes someone who quizzes?"), but it is included for the sake of completeness. Each of the six remaining themes is discussed in detail below with illustrative extracts from the interviews, all marked as follows: participant number, transcript line number (Pn, n). Square brackets ([ ]) are used to denote editorial text added to ensure that the extracts retain grammatical sense or to provide explanatory context.
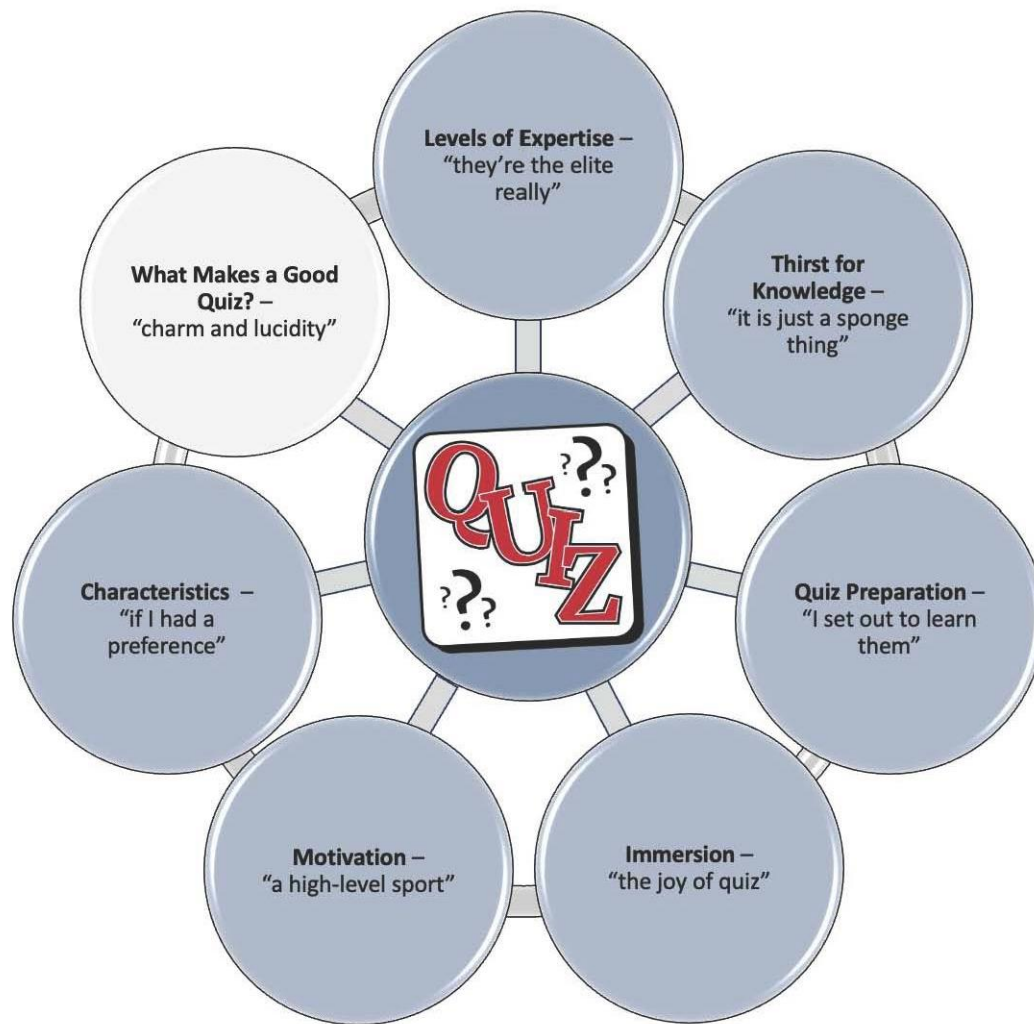
Figure 1. Themes Generated from the Interviews with Elite Quizzers

Theme 1: Levels of Expertise – "They're the elite really."

This theme supports the existence of discrete levels of performance within quiz, as recognized by the quizzing community. These levels enable performance to be benchmarked, in terms of both p-ratings (performance) and r-ratings (reputational) of expertise (Gobet, 2015), and this in turn is important in validating the domain of quiz as a field of expertise. The interviewees flagged up three levels they felt represented the main differences in expert quiz performance, broadly corresponding to Hoffman's levels of Master, Expert, and Journeyman (Hoffman, 2017). These are shown in Table 2 below, together with pertinent experience.

Table 2. Proposed Benchmarking of Expertise Levels within the Quizzing Population as Derived from Interviews in this Study

Hoffman Taxonomy	Experience
Master	Premier League quizzer. Top-flight show winner. Professional setter.
Expert	League quizzer. TV competitor.
Journeyman	Pub quizzer.

Interviewees acknowledged that Master elite quizzers were a small group of well-known, world-class performers who consistently showed exceptional performance in various quiz areas, such as broadcast quiz shows, quiz leagues, and in quiz development: Masters included professional quizzers and setters. These performers stood out within the community both in terms of performance and reputation, similar sets of names being mentioned across the board, such as "Kevin Ashman, Pat Gibson, any of those people—they are the kind of world champion level" (P7, 105). It was noted that "there are only five or six quizzers who have won *Mastermind* and *Brain of Britain* and they're the elite really" (P2, 47). Members of expert television show panels, such as the Chasers or the Eggheads, were felt to be Masters: "Eggheads are people that have won very hard TV quizzes" (P4, 225).

Choice of quiz show format was also considered a relevant indicator of a quizzer's level of serious engagement: "People that go on *Mastermind*, who are hard core quizzers; that is much less the case with *Only Connect*" (P4, 450). Elite performance in top quiz league divisions was also mentioned as a sign of Mastery. In the UK, the top-ranking league was identified as the Quiz League of London (QLL) in which the acknowledged Masters take part: "Division one [of QLL] Kevin Ashman, Paul Sinha, David Stainer, Olav Bjortomt, World Champions who are really, really serious about it" (P2, 341).

Expert level performance also related to league quizzing, though in non-premier divisions, with interviewees discussing competitive league quizzing opportunities available without the nationwide exposure of televised quizzes. League players were identified as committed individuals who competed on a regular basis, and it was noted that the QLL itself had a number of levels of expertise: "Look at the QLL because that is the premier league and they have about four divisions" (P2, 337). This provides evidence for a broad range of performance within quiz at the Expert level of benchmarking. Experts include lower ranked league division quizzers together

with individuals who participate in, but do not tend to win, televised quiz shows. Televised quiz shows, such as *Fifteen to One, University Challenge,* and *Only Connect* were commonly mentioned as providing a platform for Expert quizzers, being perhaps less elite than, for instance, *Mastermind* and *Brain of Britain*. However, a certain minimum performance level was felt necessary to enable participation: "There is no point in putting people in who are just going to get massacred; no, it doesn't make good television" (P1, 184).

This might relate to the lower boundary of Expert level quizzing. Indeed, participation in televised shows in itself implied a certain level of expertise and confidence:

> I didn't think I was confident enough to go on TV at that stage and secondly, if I made a fool of myself, you know, not that many people know of *Brain of Britain* [broadcast on radio], so I thought it would be a great way to ease myself in (P2, 41).

Journeyman quizzers were felt to be committed quizzers who participate on a regular basis but with no formalized competition structure. Pub quizzes were mentioned as a traditional outlet for such quizzing, with regular attendees usually playing in teams, enjoying the competition and being those who "committedly go to a pub quiz and have a regular team and want to do well, might even have a sort of post-mortem" (P4, 209). Even within pub quizzing a variety of challenge was noted, perhaps providing a stepping stone to higher echelons of performance. For instance, one well-known pub quiz, "Prince of Wales in Highgate which is known for having very tough quizzes on Tuesday nights" (P7, 122), provides a particularly rigorous challenge: "the difficult one in Highgate […] supposed to be the hardest quiz in London" (P6, 70).

One point noted by all the interviewees was the gender disparity in quiz, with the field being male dominated. This is found in other expertise areas (particularly at higher performance levels), such as sport (Baker et al., 2009; Coutinho et al., 2014), chess (Gobet, 2015), music (Hallam

et al., 2017, 2018), poker (Friedlander, 2024), and cryptic crosswords, where both expert solvers and professional setters are predominantly male (Friedlander & Fine, 2016). In line with these other domains, interviewees noted the relative lack of females at Master level: "Probably in the top 100 in the world you'd be lucky if there's, I don't know, three, four, five women, if that" (P2, 346). They also noted differences at Expert level, too: "[Quiz leagues] tend to be male-dominated—I think my team is unusual to have two women in there" (P5, 395). However, there may be a more even distribution at Journeyman level: "I would say at the pub level it is almost …er… 50/50" (P2, 328).

One possible factor may be male competitiveness, which has been shown to be important in gender disparity in other domains, such as poker (Friedlander, 2024; Palomäki et al., 2016). As already discussed, competitiveness may act as a potent motivational driver, particularly at higher levels, and this may be stronger in males: "The more competitive nature of it, it is more sort of male thing than female" (P5, 401). This was noted as being less apparent at lower quiz levels: "I'm almost certain, that you know, in the lower divisions maybe where it's a bit more kind of done for pleasure and a bit of fun, there's a lot more women who take part" (P2, 339). Indeed one quizzer explicitly linked competitiveness and testosterone, commenting as follows:

> It's this competitive drive, if you are in a competition then you wanna stamp all over the opposition, quite honestly, you know, okay and it's not just winning, it's utterly massacring the opposition, so it's testosterone by any other name (P1, 262).

This argument that competitiveness might play a role in the under-representation of women in quiz was, however, explicitly challenged: "I see in me the same competitiveness as a sport person, and I know some women with whom I quiz with have the same urge"

(P1, 365). Gender stereotyping was not an issue for one female interviewee: "When I started *University Challenge* it so quickly became clear that I was very good at it, that it didn't pop up at all" (P3, 400).

Public perceptions may also be relevant, with one female participant noting that the gender question "does get asked a lot about *University Challenge,* a lot and partly that is, of course, because it is meant to be a sort of reflection of education, and therefore this idea of representation ought to happen" (P3, 379). The stereotypical (and potentially male) view that quizzing is less popular for females as it does not cover typically "feminine" topics was strongly contested:

> I have heard various idiotic things about how they should make quizzes more, you know, feminine and appealing to women, and I think most of the women that I know, certainly including me, would stop doing quizzing straight away if it got like that (P7, 331).

Interviewees noted that quiz show organizers try to redress the balance both for competitors, "*Brain of Britain* for instance, they are continually asking for women contestants" (P5, 384) and for quiz show hosts, claiming that they "go out of their way to recruit more female presenters" (P6, 488), even though Connor (2016) suggests that viewers at home trust correct answers from male more than female quiz hosts. Gender disparity and its causes is clearly an issue in quiz expertise, and it was generally an uncomfortable topic for most of the expert interviewees.

Theme 2: Thirst for Knowledge – "It is just a sponge thing."

Having established that elite quizzers exist, it is natural to ask how they develop their prodigious knowledge. All the interviewees demonstrated a thirst for knowledge, suggesting that they found learning to be enjoyable, both in relation to acquiring new information and the subsequent opportunity for demonstrating their impressive

retention and retrieval on demand. The interviewees stated that from an early age they had been immersed in fact-rich environments, stimulating their curiosity and their interest. This level of interest and enjoyment appears to have facilitated the laying down of particularly strong memory traces (Furnham et al., 2007, 2008; Wade & Kidd, 2019), supporting their subsequent ability to recall these details in quiz situations. By contrast, memory was weaker for those topics for which they had little interest.

Memory was a particular strength for all interviewees. Some described their memory as having a "sponge-like" capacity, highly suggestive of an efficient aptitude for memory (Flanagan & Dixon, 2013; Schneider & McGrew, 2012, 2013), "It is just a sponge thing, it's pure retention" (P1, 419), and another interviewee suggested, "I think of that [a strong memory] as that kind of mentality of sort of collecting knowledge" (P3, 240). One interviewee expressed that retention occurs through a seemingly natural process driven by enjoyment: "I enjoy discovering things through sort of being in the world, I suppose, having the radio on, reading and then recovering them" (P4, 336). This may indicate that an aptitude for good memory encoding, retention, and recall of information in which they have an interest is a potent indicator for many involved in the field, at least at Master level. Such natural and potentially incidental absorption of information also suggests that DP may not be as important for some elite quizzers as for other domains of expertise, at least for topics they are interested in, and this is picked up in Theme 3.

Further strengthening the case for a naturally strong aptitude for memory linked to curiosity and interest, most interviewees recognized that they had possessed an exceptional memory since childhood for a broad range of topics. Interviewees spoke of childhood memory being remarkably strong, "What really sticks is what I read in Ladybird books as a kid" (P1, 101), with an equally enthusiastic interest in knowledge and facts, "*Dunlop Book of Facts*—it was just wonderful, high mountains, longest rivers, all that good stuff, and it was great" (P1, 233). This was echoed by another interviewee who, from a young age, had been interested in learning world facts: "I know the order of the kings and queens of England because when I was about nine, I sort of thought this would be a good thing to know" (P3, 129). This suggests that engaging in an enjoyable activity and learning through the process is something that was second nature to the interviewees, and that this had been occurring since childhood, often with parental encouragement. For instance, interviewees reported childhood visits to museums, cathedrals, and archaeological sites: "very much the sort of holidays where you went and saw things and talked about them" (P3, 215). The interviewees were also aware of their memory-related strengths and weaknesses within quiz performance parameters. This suggests a metacognitive awareness of their competencies: "I've always been involved in theatre, and I've never had any problem remembering lines" (P1, 121). In contrast, gaps in memory were also acknowledged: "I do have certain weaknesses like food and drink" (P5, 96).

The interviewees noted that they were naturally drawn to (and more likely to retain information pertaining to) topics in which they had an interest: "Food and drink is one of my strongest subjects because I love cooking in a serious way" (P7, 336). This suggests that memory is enhanced when actively engaged in the subject matter (Furnham et al., 2007, 2008). Indeed, level of curiosity has been shown, along with objective knowledge, to positively predict learning (Wade & Kidd, 2019), and an intrinsically motivated curiosity mind-set appeared common among the interviewees (see further Theme 5). In the absence of interest in a topic, the interviewees admitted to being less likely to remember information, and focusing on those subjects becomes a more effortful and potentially less enjoyable process, one of the characteristics of DP, as discussed in Theme 3. Interests and careers also tended to influence whether the information acquired was "low-" or "high-brow": See the discussion under Theme 6.

One source of interesting material was reading, which was discussed as being an enjoyable activity, both in childhood, "later childhood and kind of reading Usborne books, I

mean I read a lot of factual books as well as fiction books and that's how I knew a lot of the things I knew on *University Challenge*" (P3, 200), and as an adult, "I do read a lot besides that, I am an avid reader anyway, but I tend to read for relaxation" (P1, 109). In terms of reading, encyclopedias were noted as being particularly influential, with all interviewees commenting on fond childhood memories regarding the pure enjoyment of reading through them. Interviewees commented on regular engagement, where "my parents got an encyclopedia, *Knowledge* [a weekly subscription], [...] absolutely fascinated by that when I was a child" (P5, 199). It was a common activity to set aside time to immerse themselves: "certainly when I got older and first started getting into quizzing when pub quizzes came about [...] you could get a single volume encyclopedia, and I could just sit quite happily and read for hours, yep" (P2, 182). Interviewees also mentioned other hobbies which indirectly influenced quiz performance, such as stamp collecting. This hobby introduced collectors to more peripheral knowledge that could be gleaned in the process, one interviewee noting that "it did give me an interest into where they came from, learning about the countries, the history, yes" (P5, 191).

The material above suggests that quiz provides an opportunity to make "a gratifying game out of all that knowledge sploshing around in our heads" (Connor, 2016, p.3), much of which appears to have been accumulated opportunistically since childhood, and that the interviewees demonstrated a retentive, sponge-like memory with a powerful drive to acquire general knowledge, particularly in fields of interest. This aligns with a high NfC (Cacioppo et al., 1984; Furnham & Thorne, 2013), reflecting a strong intrinsic desire for cognitive challenge, knowledge, and understanding: "so anything that asks, that tests your brain is, you know, I find that stimulating and that has always been the case [...] it's just the way I've always been" (P5, 179). As an example, one interviewee stated "[as a child] I went through the appendices of the *Lord of the Rings* and sort

of tried to work out what they were saying about how to decipher the Elvish" (P3, 241).

The interviewees noted a strong desire to continue learning, stating that they had "always wanted to expand and learn about how things worked, and what they did, and where they were, and where they came from" (P5, 201), implying a curiosity mind-set and high NfC. Quiz provided ongoing learning opportunities in terms of exploring details and facts: "If it's an interesting fact, yeah, I would take that on board, and I might even look it up and chase it further" (P5, 277). This NfC also extended to setting quizzes: "It's my seven days a week job to keep my brain active, I would miss it if I wasn't [doing so]" (P6, 214). Making new connections between previously unconnected facts was also highlighted as particularly enjoyable:

> The best thing is when you get both, it is something you slightly know and then you work out what the answer's got to be and get it right, but discover a new thing in the process of doing it (P3, 354).

This theme Thirst for Knowledge therefore demonstrates the importance of having a strong, retentive memory with a sponge-like ability to absorb information, driven by a high level of curiosity and NfC (Furnham & Thorne, 2013). These factors create a powerful explanatory mechanism for how quizzers (at least at the Master level) are able to approach the challenge with an astonishing repertoire of facts, without necessarily resorting to DP, something we pick up in the next theme. Exploring the relevance of these factors across the breadth of performance levels from Journeyman to Master will enable us to see the extent to which this retentive, sponge-like memory and curiosity mind-set are universal across the field of quiz.

Theme 3: Quiz Preparation – "I set out to learn them."

We have seen how expert quizzers tend to be naturally curious and inquisitive, and have high NfC, and indeed Maylor (1994) notes that "the general knowledge tested in the quiz

[*Mastermind*] is probably acquired incidentally and over a very long period through wide reading and interests" (p.106). Yet, among participants there was a clear divergence of opinion as to whether practice was also a key feature of quiz expertise. Following the multimodal approach it could be argued that this thirst for knowledge by itself might not be enough to enable elite performance. To address this point, interviewees were asked what activities they considered to be practice in the field and in particular which of these, if any, they themselves did.

Considerable attention has been paid to the construct of "deliberate practice" (DP). Commonly understood to involve the unenjoyable, tedious, structured, private rehearsal of domain-specific skills with actionable feedback (Ericsson et al., 1993; Ericsson & Towne, 2010; Howe et al., 1998), DP is a vital component of skill acquisition in many domains (Campitelli & Gobet, 2011). Nevertheless, the definition of DP is not stable (Friedlander, 2024). One key issue concerns whether DP is "not inherently enjoyable" (Ericsson et al., 1993, p.368), being a state of focused attention on repetitive tasks targeted to maximize improvement. In this same article, Ericsson further argued that this state of concentrated attention was antithetical to the inherent enjoyment of a flow state in which individuals are completely immersed in an activity (Csikszentmihalyi, 1990), with de Bézenac and colleagues (2009) describing a classical music tradition of "long years of drudgery" employed in "mind-destroying drill" (p.11). However, Ericsson subsequently (2020b) backed away from this position, arguing instead that a lack of enjoyment, although a common experience, was not a definitional characteristic of DP.

A second issue relates to the nature of the training regime and in particular whether it needs to be undertaken with the guidance of a coach (Hambrick et al., 2020). Ericsson was himself inconsistent on this point, sometimes arguing that DP required the knowledgeable input of a teacher (e.g. Ericsson, 2020a, 2020b; Ericsson et al., 1993), but at other times

claiming that the performer can devise their own training regime (e.g. Ericsson, 1998, 2007). Indeed, Ericsson's studies involving the acquisition of crystalized knowledge relating to words—Scrabble (Tuffiash et al., 2007) and Spelling Bee (Duckworth et al., 2011) —were later reconceptualized by him as "purposeful practice" on the grounds that they provided "no record of a teacher/coach supervising all or most of <the> practice" (Hambrick et al., 2020, p.5). Quiz has similarities to Scrabble and Spelling Bee in that it does not involve a coach. For this reason under Ericsson's changed definition (2020), certain structured quiz practice activities could also be considered as purposeful practice, with other perhaps less structured activities being closer to "deliberate play" (see definition below). In the discussion which follows, the more familiar term DP is adopted as a broad umbrella term for convenience, while recognizing that quiz training covers a wide range of more or less structured and/or enjoyable activities.

All interviewees mentioned activities which could be considered relaxed or informal practice, such as doing online quizzes, using mobile phone apps, and watching televised quizzes. These were likely to lead to incidental learning and were derived from an enjoyment of learning and an authentic and genuine desire to engage in quiz. Broadcast quiz shows provided opportunities for some, "I have got a few quiz apps on my phone; I play along with quiz shows" (P4, 18), while affording the opportunity for gentle rehearsal of knowledge, "I do quizzes online just purely for revision purposes really" (P5, 79). This gentle rehearsal or practice does not meet the criteria of DP, as it appears to be undertaken mainly for the enjoyment of doing so without the intervention of a coach or trainer; nor is it purposeful, not being carried out for any strategic or deliberate intention of targeted performance improvement. Indeed, these activities may align better with the concept of "deliberate play" (Côté et al., 2007), which includes activities that incidentally or indirectly affect performance in the field, where an individual engages primarily for the intrinsic enjoyment of the activity, without a formal

program of instruction targeting specific improvement areas. While the primary focus of DP is on the outcome of the training, deliberate play is mainly driven by the enjoyment of participation, with improvement being a welcome but tangential by-product.

Interviewees discussed a diverse range of quiz-related improvement strategies, such as honing their buzzer technique and keeping abreast of current events. For example, topping up knowledge of recent news items was noted: "If I'm going in for one [a quiz], I'll take a look at, ok… very good is *BBC Magazine's*… um *Seven Days, Seven Questions*" (P2, 87). Regularly watching a particular quiz as an intentional training strategy enabled a degree of anticipation:

> […] buzzer quizzes, I mean I did very well on that, because I could buzz in early as I could tell where the question was going to go, and you get to know that by watching that program an awful lot, basically, so that is a strategy leading to a strategy (P3, 104).

Nevertheless, these activities were neither coached nor, apparently, unenjoyable, meaning that they may align better with a less stringent definition of DP ("purposeful practice").

Some interviewees suggested that the very act of participating in quiz constituted a form of practice, where quizzers are "kind of building up a knowledge of what comes up, there is a certain amount of anticipation to it as well" (P1, 134), though whether this is informal or strategic perhaps depends on the quizzer's intention. Another way of potentially improving subsequent performance was rectifying gaps in knowledge: "I think a certain amount of looking things up when you haven't known about them is quite a good way to learn things, and it makes it more likely to stick" (P7, 303), perhaps akin to the "post-mortem" mentioned earlier in Theme 1. This might also link to the concept of Need for Closure (Webster & Kruglanski, 1994), where closure is defined as a desire for an answer to resolve a state of ambiguity. These more strategic, purposeful activities suggest that some level of targeted, specific effort is

involved in enhancing quiz performance, though without the involvement of a knowledgeable coach.

Interviewees also discussed activities aligning more closely with the DP framework (Ericsson et al., 1993; Ericsson & Towne, 2010), whereby specific, effortful, and inherently unenjoyable practice routines are created with the intention of enhancing performance. This might involve setting time aside on a regular basis, "Somebody actually asked me […] how many hours per day I would spend on average preparing for quizzes […] I'd say it averages out to three or four hours a day" (P2, 85); and was felt to relate to serious commitment, "I mean if you have any form of exam, you know—it's preparation for that" (P1, 36). Although some interviewees noted researching specific areas of existing interest, "books of facts within a particular genre—it helps if you have an interest" (P1, 115), others acknowledged that the extra attention and effort required for honing up on less interesting topics was not as enjoyable: "I've taught myself to learn about these things, but I don't enjoy learning about those things as much as I love learning about, I don't know, Roman history" (P2, 239).

Indeed, five interviewees noted that working on specific weaknesses was an integral part of improving performance, either due to past frustrations, "I set out to learn them [the fifty states of America] because it always annoyed me that I could only remember forty-nine of them" (P6, 125), or in response to previous failures in situations where key facts had not been known, "I suspect that it is through experience at losing quizzes on a particular area and the determination not to be caught out with that again" (P1, 299). Some interviewees also adopted a "revision style" approach reminiscent of school exam cramming such as learning lists of information through flash-cards: "you know, read it over again and again—with flags [of the world] literally you can play cards with it, yeah" (P1, 123). Indeed, one interviewee toyed with the idea of extending one particular list, specifically for quiz performance purposes: "I know all the American Presidents since World War 2, it's not very hard and I sort of think I

wish I knew, and could push that a little bit backwards 'cos that might be useful in a quiz" (P3, 134).

However, several interviewees claimed that they did not do any DP routines, not least because they found deliberately learning lists to be an unenjoyable experience: "the idea of learning lists and stuff like the, you know, like the professional quizzers do is just anathema to me" (P7, 84). Indeed, one interviewee did no preparation at all before some quizzes: "very little, oh the actual learning, almost nothing, I mean, you know, when we were on *Only Connect*, we were in the car driving to the studio thinking 'who is in the Cabinet, does anybody know?'" (P3, 142). The same interviewee stated that they had learned lists in the past, but would not do so now: "so there are some lists like that that I know, but they reflect things that I was mostly interested in anyway at that age" (P3, 133). Those who stated they did no DP all engaged in lateral thinking quizzes such as *Only Connect*, and they expressly did not want to enter quizzes such as *Mastermind*

> …partly because it would take quite a lot of effort to find specialist subjects and to learn the right thing and I'd probably kind of get annoyed with what they chose to ask me and think it was unfair in some way (P3, 72).

It was also felt that "there is no way you can prepare for general knowledge" (P5, 101) as it is so broad and could encompass pretty much anything (Maylor, 1994), and DP is usually targeted at a specific domain. Instead, the reward of retrieving existing information, acquired naturally over the years, during the quiz itself appeared to be these interviewees' principal goal, and they explicitly claimed that practice regimes were not part of their game-plan. Indeed, one interviewee expressed a clear preference for a more natural process of learning: "I feel more satisfaction if the information that I am retrieving is something I came through by living, rather than through revising" (P4, 135).

Interestingly, despite their credentials (Table 1), some interviewees did not consider

themselves to be experts, specifically because their own definitions of expertise saw effortful practice to be a necessary component: "I'm not an expert: I think I'm very good at it in certain formats. I think of an expert as someone who has put all the effort in" (P3, 181). Indeed, another participant suggested that DP was what made them an expert: "I wouldn't say I was any different from the average: I made myself better" (P6, 375).

There thus appear to be clear individual differences in how elite quizzers prepare for quiz. Overall, having a sponge-like aptitude for encoding, together with a lively curiosity and interest in a broad range of topics, is likely to be a key advantage; but the methodical improvement of areas of weaker knowledge may further enhance the level of quiz performance at least in some formats.

Theme 4: Immersion – "The Joy of Quiz."

The material in this theme provides an insight into the depth of involvement in quiz at Master level. This allows us to understand the ways in which the interviewees are immersing themselves in the field, engaging with both quizzing itself and other quiz-related activities.

For these expert interviewees, the quiz experience was described as being more than the simple act of taking part. The quiz-related activities mentioned provide insight into how quizzing is a consuming passion at Master level. The activities also demonstrate how important quizzing is to the interviewee and the level to which they immerse themselves beyond merely doing or even watching quizzes. For instance, this included keeping a personal score alongside the show contestants, "yes, I have found myself playing for the big money against the Chaser each time and monitoring where I would be on the board" (P6, 207), and considering themselves a competitor, "to compete against the Egghead, as if I were there [while watching TV]" (P6, 204).

Interviewees also mentioned other activities surrounding the milieu of quiz, such as reading quiz-related blogs: "I sometimes read reviews of the TV quiz shows, like last season there was an entertaining blog about *University Challenge*"

(P3, 91). Furthermore, quiz books provided immersion through pure entertainment with family: "we have quiz books around the house as well that my son enjoys reading out the questions and pretending to be a quiz master" (P4, 55). Professional immersion was also mentioned, both during normal work patterns for those who set quizzes, "I'll come across a *Sporcle* quiz that an amateur setter has created in a similar area and I end up doing that quiz because it's good fun […] so it's part leisure, part work" (P4, 52), and through additional activities, "*Joy of Quiz* [Alan Connor's book about the milieu of quizzing], yes, I read a proof copy for him" (P6, 63). The interviews thus demonstrated a variety of quiz-related activities that the interviewees participated in, which could be regarded as immersion.

Moreover, the interviewees were currently highly engaged in quiz, listing a broad range of quiz formats in which they actively participated. This included televised and radio quiz shows, quiz leagues and pub quizzing, mirroring the formats discussed in the literature review. In addition to the range of formats, the sheer volume of quiz activity was apparent, "I have appeared on several TV programs, in fact eleven to date" (P5, 17), signifying the high level of active engagement and commitment involved. A dedicated effort to continue participating was also apparent, both on television, "this year [2017] I was on some episodes of *Only Connect*" (P3, 5) and on the radio, "I've just been re-accepted for *Brain of Britain*, that was my first foray into serious quizzing if you like, was *Brain of Britain*, that was five years ago" (P2, 39). This provides evidence that these interviewees, already quiz experts, still continue to strive and compete in broadcast quiz shows, despite their having a time-consuming and effortful application process.

League quizzers also explained that a determined commitment was necessary to attend regular events, either monthly, "the main one I do is the *Grand Prix* circuit which takes place every month which is run by the British Quiz Association" (P2, 15), or even daily, "it [*Learned League*] all happens online and there are sort of four- or five-week seasons where you

play a game every work day" (P3, 145). These formats require both a time commitment and an ongoing determination, suggesting continued engagement and immersion, as well as a high level of motivation. Interviewees also indicated that their commitment to pub quizzing was overall an enjoyable experience, "it's a very pleasant way to spend a Sunday evening" (P1, 2), and that some engaged on a weekly basis, again requiring dedication, "most nights I do actually enjoy going out, only occasionally I may feel it's a chore, but not very often" (P5, 232). Additionally, post-quiz discussion (a "post-mortem"), mentioned earlier, could be taken as a sign of immersion.

The above material reveals highly engaged individuals at the Master level of expertise, who continue to immerse themselves despite already achieving highly regarded quiz successes. This theme thus encapsulates commitment and dedication to engage and immerse themselves in the arena of quiz. This dedication to both quiz and the wider quizzing milieu could be seen to align with a Rage to Master (Winner, 1996; Winner & Drake, 2013), the passionate pursuit of excellence (i.e., Master-level performance) through intrinsic motivation and emotionally invested commitment.

Theme 5: Motivation – "A high-level sport."
Given the levels of immersion and passion that some quizzers clearly experience, we can ask what motivational drivers might be responsible for both starting quizzing and then maintaining one's high level of involvement. NfC has already been noted (Theme 2) as a powerful intrinsic motivator driving engagement with fact-rich materials. Interviewees mentioned a number of other factors, both intrinsic and extrinsic (Amabile et al., 1994), although their relative importance no doubt varies between individuals.

All interviewees commented that the social aspect of quizzing was an important and rewarding element of participation: "I go for the chat around the table and the moments where you give an answer that you didn't know that you knew" (P4, 326). Spending time with like-minded others was a positive aspect of quizzing,

there being "something congenial about sitting around with people that you get on with, and have a similar geeky streak, and have a pleasant drink together" (P7, 193). This congeniality was felt to add to the quizzing experience: "I prefer to keep it broad; I like the teams, I like the fun, and I like batting stupid ideas around with other people" (P1, 32). This related to both a community spirit with one's own circle, "it's a team of friends who come from, you know, the same area that I live and we're all into quizzes, so we do socialize together but at the same time we are deadly serious about winning it" (P2, 202), and the opportunity to meet others:

> One of the things I like about the *Grands Prix* I go to, you do an individual quiz and then in the afternoon they do ad hoc team quizzes, you could end up with people you haven't met before, you might have heard of them in the quiz world (P2, 205).

Quizzing for pure enjoyment was regularly mentioned, often employing the term "fun," both from a player's perspective, "if you are gonna give up an hour of your time you gotta care about it" (P1, 83), and from the point of view of a setter, "as a quiz master, it's my baby, you know, I want to run the evening and I want to be the one that enables people to have fun" (P6, 439). Positive reinforcement from enjoyable quiz experiences is likely to keep people quizzing, but enjoyment was also described as important for initial engagement in quiz: "because I enjoy it, I just grew up watching *University Challenge*—and *Only Connect*, similarly in a way, we started watching it because it was lots of fun" (P3, 83). It was also noted that participating in quiz could still be enjoyable even without winning: "it's not that people don't want to win but firstly, it's lots of fun and people are doing it for the fun of the process [regarding *Only Connect*]" (P3, 283). It is also interesting to note that those at the top of their game do not stop quizzing once they've won "the big one."

A further potential motivational driver was the satisfaction experienced from the "Aha!"

insight moments inherent in quiz: "it's always a joy when you pull something out… triumphant" (P1, 285). Such experiences, also termed "cognitive snaps" (Weisberg, 2015, p.21) or "penny dropping moments" (Friedlander & Fine, 2018, p.6), are associated with a feeling of warmth, pleasure, and satisfaction, involving the release of dopamine and endorphins, and have been shown to be an important motivational driver in expert cryptic crossword solving (Friedlander & Fine, 2018). The buzz created by an Aha! moment was noted as an important intrinsic motivator for quiz too: "I think actually that [Aha! moment] is probably more important than how many I score in total, particularly if you find an answer that is sort of deduced" (P7, 157). This is likely to be particularly true for less semantically straightforward quizzes, such as *Only Connect*, although the enjoyment of analytically reasoning the way to an answer was also deemed rewarding:

> I try to remember those Greek words and try to invent an English word, and on some occasions I would do that correctly, and it would be the right answer, and that was the thing I was proudest of really (P3, 360).

An interesting point raised by the interviewees was their difficulty in understanding why people would cheat at quizzes. Given their view that the key aspect of quiz is to retrieve personally held knowledge while having fun, they felt that cheating was "not playing the game, because the game is to retrieve information without aid" (P4, 262). This was felt to reduce enjoyment: "I guess it wouldn't be much fun for them if they do, as it is all just for fun" (P3, 64). The question of why people break rules was raised, one interviewee noting that "some people don't think of it as cheating, that is just the way they do things, honestly to some people it doesn't occur to them that it is the wrong thing to do" (P7, 312). The size of the reward was also mentioned, "I find it baffling because the prizes are never that big, so the motivation can barely be financial" (P4, 261), although the case of Major Charles

Ingram, found guilty of cheating to win a million pounds on the UK version of *Who Wants to be a Millionaire?* suggests that reward value can sometimes be relevant (Plaskett, 2024). Overall, cheating clearly bemused the interviewees, all highly immersed in quiz themselves, and they felt that "when you are actually taking part, and when it's competitive, then you should do it in your head and not use, um, any kind of reference" (P7, 323). However, a YouGov poll of over 2000 people in the UK suggested that at least 10% of pub quizzers have admitted to some form of cheating: "Sometimes, the answer to a question comes from, um, somewhere other than your memory" (Connor, 2016, p.228).

In addition to the enjoyment and social interaction quiz affords, together with the opportunity to utilize one's knowledge (allied to NfC), all interviewees mentioned the importance of competitiveness in quizzing. Competition was felt to be an essential part of quizzing, "I want it to be something that I enjoy, but it is impossible not to feel a little bit competitive" (P7, 149), and winning was felt to be important, "Certainly when I'm in a quiz, most quizzes I'm trying to win, trying to win the thing" (P2, 208). Striving for the best outcome in relation to one's own performance criteria was noted, as well as extrinsic competition with opponents:

> I had very much grown up [as a child] shouting out the answers, and thought I would be good at it, and that is why I wanted to do it, because I thought I could do well, which is to do with beating other people, but it is also to do with pursuing excellence (P3, 256).

This was reiterated by another interviewee in relation to world-class (i.e., Master) performance: "There's a world championship each year and there's a European championship and I'd dearly love to win, one of the really big ones, become the world number one" (P2, 197). This speaks to an enthusiasm for quizzing at as high a level as possible, pointing to personally held ambitions and a wish to improve performance.

As well as the intrinsic pursuit of individual excellence, improving performance ratings and beating opponents were also noted as motivations for quizzing: "People are very competitive about their place in the league tables" (P7, 145). Indeed, one interviewee said that "some people consider it [quiz] a high-level sport" (P1, 106), adding, "I see in me the same competitiveness as a sports person" (P1, 365). The strength of their competitive feeling was quite intense ("stamp all over the opposition"), as already noted under Theme 1.

Winning prizes was clearly noted as a motivational driver, as it provides acknowledgement of the level of one's performance in the form of extrinsic reward: "You could win a computer for your school, which is why I was basically going for it [participating in a school quiz]" (P4, 68). Winning prizes also implies a certain level of recognition and reputation, which was likewise important to the interviewees:

> The year before last at Christmas the *Guardian* and the *QI* people [ran a quiz] […] in West London and I got a team together and we won by quite a substantial margin […] the *Guardian* didn't even […] cover it at all, which I was quite miffed about (P7, 292).

As noted in the above discussion of cheating, the value of most prizes is not that high, but those that are high evince a strong feeling of competitiveness: "The competitive edge is very… to me, there has to be one: *The Chase* wouldn't work without the money element, without the gambling on going high or going low" (P6, 254).

Theme 6: Characteristics – "If I had a preference."

All interviewees frequently mentioned preferences in relation to quiz activity, tending to favor one type of quiz over another. These preferences reflect the multifaceted nature of quiz, and individual differences in the patterns of cognitive and other traits may underlie such

preferences, explaining an individual's choices within the field of quiz and the opportunities that it offers. This theme thus reflects differences both between quizzes and between quizzers.

One preference concerned the distinction between factual and lateral quiz questions. Some interviewees preferred answering factual questions through direct retrieval from LTM: "if I had a preference, it would be what is the capital of so and so" (P2, 266), and "I prefer the general knowledge quizzes" (P5, 42). This emphasises the importance to some quiz experts of straightforward memory recall, perhaps providing them a welcome opportunity to demonstrate their prodigious "knowledge sploshing around in [their] heads" (Connor, 2016, p.3). Conversely, all interviewees agreed that while lateral thinking questions also involve memory retrieval, they provide an additional opportunity to reason the way to an answer: "*Only Connect* is where you have to deduce answers, so there's an additional aspect to it" (P5, 40). This can provide an extra challenge, "I didn't know it [the answer] but knew some facts around it that enabled me to have a good guess" (P4, 142), while adding to the overall feelings of enjoyment, "I feel myself getting excited when you are using knowledge from different parts of memory and putting them together" (P4, 98). This further suggests a role for NfC, as discussed previously in Theme 2.

Factual and lateral quizzes differ to an extent in their cognitive challenges, and the CHC theory of cognitive aptitudes reviewed earlier (Schneider & McGrew, 2012, 2013) provides a framework in which to discuss them. Preferences for factual or lateral quizzes may reflect the relative importance of Gc (comprehension knowledge) or Gf (fluid intelligence/reasoning) respectively. For factual quizzes in particular, K0 (general verbal knowledge, a subtype of Gc) and Glr (encoding and recall) may play a role, so people with these strengths may prefer such quizzes. For those with higher Gf, lateral quizzing may be a more attractive option, given the greater need for reasoning and deduction in quizzes such as *Only Connect*. Thus, these cognitive preferences will

potentially determine the quiz format chosen, and most interviewees expressed a clear preference for one format over the other, potentially driven by their cognitive profile. It would be interesting to explore whether this might also affect their practice regime, with quizzes with high knowledge-based demands potentially encouraging a higher level of list-learning.

Interviewees also discussed preferences relating to general knowledge versus specialist subject quizzes: *Mastermind*, for example, requires good performance in both. Some interviewees preferred general knowledge quizzes: "coat it with a bit of general knowledge and I go for it, and I can do it" (P1, 442). This related both to competitive urges, "being able to say you have the broadest knowledge" (P5, 151), and to a broad and culturally stimulating environment, "I think having a very broad interest which I attribute to the fact my parents are both scientists by training, and my brother and I grew into humanities people, so there was always a lot of cross-cultural talk" (P3, 206). A preference for broad, general knowledge quizzes may therefore be more related to a sponge-like aptitude for naturally acquiring information, as discussed in Theme 2. Specialist quizzes, on the other hand, were suggested to require more preparation and effort (such as DP), one *Mastermind* winner saying the "specialist subject on *Mastermind* is like an exam more than a quiz" (P5, 108). Indeed, P3 did not take part in specialist quizzes of this type because of the effort involved (see Theme 3).

Interviewees also mentioned subject preference relating to different areas of interest or knowledge, which they discussed as high-brow/low-brow. High-brow topics were referred to as facts representing a "permanent" bank of knowledge generally considered important to mankind, described as education-based, high-culture, academic subjects: "he's brilliant on high-brow stuff, you know classical music, opera, science" (P2, 122). Conversely, low-brow subjects were described as ephemeral, transitory facts which are "current affairs," such as pop music and sport, which follow trends of social settings. These topics could be seen as

inconstant due to regular or frequent changes within fashion or popular culture, and appear to be enduringly popular within quiz, as they provide the opportunity for testing knowledge of specific events or information coming from a given time period. Sport was seen to fit the structure of quiz as a low-brow topic, since "it's such a huge world of information, names and dates and it's sort of perfect for quiz as there are undisputed facts [score, year, gold medal winners] great for its quiz structure" (P4, 74).

Quiz provides the opportunity for both high- and low-brow subjects: "one thing that is nice about quizzing is it's quite, er, equal opportunities when it comes to high-brow and low-brow" (P4, 90). One exception to this general rule might be *University Challenge*, due to its principally academic content and participation by competing UK university teams. Contrasts were drawn between the two types of subjects, with a suggestion that "there are very few quizzers who can cover both areas, or are very strong in both areas [high-brow/low-brow]" (P2, 125), although the distinction was not always clear: "A lot of the stuff I would call low-brow some people would probably call high-brow" (P5, 316). This interviewee noted, "I'm not very good at Shakespeare or art and books generally, but I can answer questions on *Thunderbirds* or *I, Claudius*" (P5, 319), where *I, Claudius* (the BBC television series) would probably be considered by many as high-brow.

One interviewee attributed their subject preferences to personal interests, where they were "involved with a lot of traditionally high culture, so a lot of my knowledge is around that kind of thing" (P3, 424). As a result, they showed a clear preference for high-brow over low-brow subjects, "I am not interested in sport really […] an area of low-brow question" (P3, 425), and indeed were on the overall winning team for one series of *University Challenge*. This link to personal interests echoes the material already discussed under Theme 2.

Another interviewee noted that their preference for high-brow or low-brow topics changed over the years: "I suppose initially low-brow pop music as I grew up with that and sport, but as I got older and became educated [I]

became more interested in literature and philosophy and arts, politics, so I don't mind either actually" (P2, 147). However, this interviewee did draw a contrast between the two types, "I'm quite interested in the arts and history, but I'll never be as interested in stuff like food and drink and fashion and video games" (P2, 237), again demonstrating that this preference ultimately stemmed from personal interest.

Discussion

As an initial pre-GECA stage (Friedlander & Fine, 2016), these semi-structured interviews with seven elite (Master) quizzers generated seven themes (six reported here), yielding rich insights into the structure of quizzing expertise, together with its characteristics and motivational drivers.

An important criterion for any domain of expertise is the ability to objectively benchmark and differentiate between different expertise levels (Gobet, 2015). As per Theme 1, clearly identifiable benchmarks are suggested for Journeyman, Expert, and Master level quizzers (see Table 2), and a broad range of performance levels likely exists within the domain of quiz (Hoffman, 2017). There were also interesting insights into gender inequality, specifically a lack of females at top levels, mirroring the situation found in certain other expertise domains (Friedlander, 2024). There are a range of quiz types and formats, as discussed in the literature review, and Theme 6 suggested that the elite quizzers interviewed have varied preferences for these types and formats in terms of factual or lateral, general knowledge or specialist subject, and high-brow or low-brow quiz questions. Although not specifically covered in the interviews, it is likely that these preferences may relate to individual patterns of cognitive strengths in terms of the CHC model, as outlined in the literature review. Future research should address this.

A key research question addressed by this study relates to how successful quizzers know so much information and can also recall it when required. In addition to the relevance of cognitive aptitudes to quiz performance, other

pertinent individual differences potentially relate to the nature and extent of quiz preparation, such as practice regimes, as well as childhood environment and early quizzing experiences. Themes 2 and 3 provided important evidence addressing these points. All interviewees admitted to having strong memories: A thirst for knowledge and curiosity mind-set, together with a high NfC and an almost sponge-like ability to absorb new information, were felt to be central to the development of quiz expertise. The interviewees also noted the influence of childhood experiences, including perusing encyclopedias and visiting museums, as being key to their love of facts and accruing new knowledge.

There was, however, some ambivalence as to the importance of effortful preparation for quiz, particularly the use of DP, as covered in Theme 3. There were differing practices among the interviewees, some specifically list learning and studying to patch holes in their knowledge, whereas others stated that they did no DP at all, relying on their sponge-like memory for picking up information incidentally. This is consistent with the finding that DP is less important in some domains than others (Friedlander & Fine, 2016; Hambrick et al., 2020). It was further noted that preparing for general knowledge quizzes is implausible, given its breadth (Maylor, 1994), and DP, if used at all, was felt more important for certain quiz formats than others.

A further research question concerned the motivational drivers for starting quizzing, continuing quizzing, and being immersed enough in quiz to become an expert. Theme 4 demonstrated that the interviewees are all highly immersed in and engaged with quizzing, both in terms of the quantity and the variety of their quizzing and quiz-related activities. The extent to which this immersion is necessary for quizzing excellence is unclear, but its existence does suggest a high motivation for spending time quizzing, conceivably akin to the Rage to Master, found in some other expertise domains (Winner, 1996; Winner & Drake, 2013). Theme 5 discussed various motivational drivers, both intrinsic and extrinsic, notably enjoyment (of

quizzing generally and "Aha! moments" in particular), competitiveness, and the social interaction often involved. These were still evident in the Master quizzers interviewed, suggesting that success does not decrease subsequent motivation and engagement. A perhaps unexpected finding was the interviewees' bemusement as to why people would cheat at quizzes, given this generally went against their own reasons for quizzing, and despite evidence that pub quiz cheating is by no means an isolated occurrence (Connor, 2016). Research as to why quizzers cheat is lacking, but studies on student cheating in academic tests might shed some light on this (Waltzer & Dahl, 2023; Watts et al., 2024), notwithstanding the potentially different consequences of failing to win the quiz or pass the test and the consequences of the cheating being discovered.

Conclusion

Overall, then, this study has been beneficial in two ways. First, it serves as a proof of concept for an additional pre-GECA stage ("Stage 0") to reinforce the validity of any GECA Stage 1 survey (Friedlander & Fine, 2016; Hambrick et al., 2020). One of the strengths of GECA is the acknowledgement that any research program investigating a relatively unexplored niche domain of expertise should not be based on potentially biased researcher presuppositions. It should therefore start with a comprehensive and wide-ranging exploration into the characteristics of the population active in that domain (Friedlander & Fine, 2016). However, knowing what such an exploratory survey should cover relies on the researchers having a reasonably strong familiarity with the domain so as not to omit any key concepts or motivational drivers. Although this was the position in the first GECA study into cryptic crossword expertise (Friedlander & Fine, 2016), where both researchers were already active in the domain, this was not felt to be the case for quizzing. Embedding a pre-GECA qualitative stage through interviews with recognized experts in the field led the researchers to be more confident that no important aspects would be omitted from the subsequent survey. For

instance, both the gender disparity and the expert quizzers' view of cheating had not originally been in the researchers' purview, and without Stage 0 those aspects might have been omitted from the subsequent Stage 1 survey.

Second, this study has yielded a rich body of data concerning both the characteristics of elite quizzers and potential factors involved in the development of quiz expertise, demonstrating the validity of considering Quiz as a domain of expertise and suggesting the existence of objective benchmarks for various performance levels from Journeyman to Master (Hoffman, 2017). Given the nature of qualitative research, the above themes strictly relate only to those elite quizzers interviewed, but nonetheless provided both reassurance and an indicative framework for crafting the GECA stage 1 survey, allowing us to investigate how relevant the material outlined above is to the broad population of quizzers, across the whole range of performance levels. Thus, in line with the fixed, exploratory, sequential mixed-methods design of which these interviews are the first part, and bolstered by the knowledge gained from the interviews, the authors were then able to develop a more comprehensive GECA stage 1 survey than would otherwise have been the case. This has now been run, with a sizeable sample of over 500 responses, and the results will be reported elsewhere.

Endnotes

1. Julia Roberts in Erin Brockovich; Zambia and Zimbabwe; Michelangelo

2. Please see Table A in the Appendix for more information on UK broadcast quiz shows.

3. For example, the missing item in this sequence: *Close window; Cut; Redo; xxxx* is *Undo*. Why? Because their keyboard shortcuts are, respectively, Ctrl-W, Ctrl-X, Ctrl-Y, and Ctrl-Z (Freeman, 2021). In this case the solvers would have to recognize that they are given computer commands, realize that the keyboard shortcuts are relevant, notice that those provided are in sequence W, X, Y, realize that the next letter is Z, and finally know what Ctrl-Z does.

Authors' Declarations

The authors declare that there are no personal or financial conflicts of interest regarding the research in this article.

The authors declare that the research reported in this article was conducted in accordance with the Ethical Principles of the Journal of Expertise.

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Appendix

Table A. Characteristics of Example Quizzes, Mainly UK-Based

Quiz	Characteristics	Hypothesized challenges
Trivial Pursuit (game)	Interactive board game with a GK question bank. Answer questions to gain "wedges" – first to collect all six wins. Play solo or in teams against others, both asking and answering questions. Not formally timed.	Recall of factual information. Some strategic play in terms of "stealing wedges" from opponents.
Sporcle (website)	Almost 2 million quizzes on every subject imaginable – GK and specialist, as well as puzzles. Can play solo or against others in "challenges" and "showdowns." Quizzes usually timed though can be played untimed.	Depends on the quiz/puzzle. Might include recall of factual information, deductive reasoning, spatial manipulation, even psychomotor skills in typing challenges.
Pub quizzes	Sociable event with others, often in teams. Questions in rounds, asked by a quizmaster. Usually GK, though may be themed rounds. Modest prizes. May be accompanied by alcohol.	Recall of factual information. Social cognition may be important for deciding on a single answer as a group (if in teams).
Quiz leagues	e.g. Quiz League of London, which has four divisions. Similar to pub quizzes, with themed or GK rounds, either team-based or individual, but wins/losses affect the team's league position over a season. Many formats differing between leagues.	Similar to pub quizzes, though may be trickier questions in higher divisions.
Brain of Britain (radio)	GK. Four individual contestants, who can answer up to 5 questions (and get a bonus point) before questions pass to the next contestant.	Recall of factual information, which may include trickier questions. Coping with presence of an audience and the fact it is broadcast, though in audio only.
The Chase (TV)	GK. Four contestants, strangers but cooperating. Initial "cash builder" round against the clock. Second "chase" round against a professional Chaser - if beaten, then out. "Final chase" for those still in against clock, and against Chaser.	Recall of factual information under time pressure. Coping with both time pressure and an audience (broadcast). Not being intimidated by the Chaser. Buzzing fast in the final chase.
Mastermind (TV)	Both GK and pre-determined specialist subject, often quite high-brow. Four competitors, one eventual winner. The whole round is timed, not the individual questions.	Recall of factual information under time pressure, both broad and specialized. Coping with both time pressure and an audience (broadcast).
University Challenge (TV)	GK, often quite high-brow. Two teams of 4, usually University students or graduates. Starter questions buzzed in. If correct, team has 3 follow-up questions, but penalties for incorrect answers. Team with more points are the eventual winner when time is up.	Recall of factual information under time pressure. Buzzing fast but also being correct for the starter questions. Coping with both time pressure and an audience (broadcast).
Who Wants to be a Millionaire? (TV)	Initial "Fastest Finger First" on a "sequence these four answers" question to become the main show contestant. Then GK where all questions are multiple choice with 4 options. Three "lifelines" which contestants can use once each when they wish – asking the audience, phoning a friend, or removing two incorrect options. Big money available (a million pounds in the UK version) but an incorrect answer can reduce the prize substantially.	Recall of factual information. Psychomotor speed and decision making for the Fastest Fingers First round. Coping with both time pressure and an audience (broadcast).
Only Connect (TV)	Two teams of three players. Four rounds with generally difficult questions. Rounds involve making connections between items or putting items in sequences or sets. Rounds have a time limit.	Recall of factual information. Fluid intelligence and adaptive problem-solving ability to make connections. Coping with both time pressure and an audience (broadcast).

Note. GK = general knowledge

Table B. Selected Interview Topics and Example Prompts

Interview Topics	Example Prompts
Quiz engagement	What forms of quizzing do you take part in and why? What other activities do you do related to quiz? What for you makes a good quiz?
Quiz preparation	What strategies do you use to help you prepare for quizzes? If none, why not? Where do you get your information from?
Quiz experts	Who would you consider an expert in quiz, and why?
Quiz motivation	What are the main drivers or motivators for taking part in quizzing? How did you get into quiz in the first place? What childhood experiences contributed to your enjoyment of quiz?
Other aspects of quiz	How important are the social aspects of quizzing and the quiz community? What about the effects of alcohol on quizzing performance? What are your thoughts on gender and quiz?