

### Chess Expertise

A chess expert is often thought to be a cold, powerful, thinking machine with the ability to calculate hundreds of moves and responses into the future. The chess expert knows how to respond to any move you make, and it is the uncanny computer-like brain which is the source of his power. While it is true that chess masters and grandmasters often look farther ahead into the game than amateurs, it has been found that they do not look significantly farther. Instead, they recognize patterns of pieces and access stored memories of experiences in similar positions. In this way, they are able to quickly identify which pieces are important, which weaknesses to exploit, and which mistakes to avoid. So instead of tediously calculating every possible variation, the chess expert is able to focus his attention on key areas and pieces. Thus it is not superior machine-like calculations that makes a chess expert, it is memory and the ability to recognize patterns.

To say that there are a lot of possible board positions in chess is an understatement. In a game of 40 moves, the estimated number of possible board positions is around  $10^{40}$ . In fact, after only four moves, there are 717,852 possible board positions (Weisstein, page 2). But although there may seem to be an overwhelming amount of moves, in actuality there are only a few good ones.

Take, for example, the opening moves. The board is so empty and there are so many possible pieces to move that a beginning player will often feel overwhelmed by all the choices. A good player, however, will realize that in the opening, the best strategy is to secure a stronghold in the center and open diagonals for your bishop. Thus the casual player will soon learn from experience that the best opening moves generally revolve

around advancing your king and queen pawns and then moving out your knights to watch over the center.

A common opening mistake made by casual chess players is to advance the rook-pawn two spaces with the intent to bring out the rook. Learned players know that the rook is meant to control open ranks and files and that it shouldn't be brought out until there are fewer pieces on the board. Not only does it take time (three moves) to develop the rook, but rook's potential is wasted in the usually confined opening positions. So rook-pawn openings, while perfectly valid, are vastly inferior to other possible opening moves. Thus, good chess players know that the rook is not an important piece in the opening and will not concentrate on variations involving it until the middle or end game.

In *Goodbye, Descartes*, Keith Devlin discusses the five stage model of human performance used to categorize different levels of skill acquisition. This scale was created by Dreyfus and Dreyfus, who divided skill acquisition into five stages: novice, advanced beginner, competence, proficiency, and expert. The distinguishing feature between each stage is the level of comfort that one is at with the rules of whatever skill they are trying to acquire.

If we apply this model to different levels of chess skill, then the difference between a novice chess player and a competent chess player is knowing all the rules. The competent chess player knows the rules, but has not yet learned to recognize and exploit similar situations. He will focus his attention and development on individual pieces but will not have a well-thought out, coordinated plan of attack.

The proficient player, on the other hand, not only knows the rules, but has had enough experience with the game to be able to comfortably and almost effortlessly behave in similar situations. He is able to see the relationship between different pieces on

the board and he uses his experience and intuition to limit the amount of good moves he considers. When calculating possible moves and variations his instinct will direct his focus to important parts of the board such as weaknesses in his opponent's defenses. For example, if his opponent neglects to attack the center squares in the opening, the proficient player will instantly know to exploit this by advancing his center pawns.

Under the five-scale model, we can define an expert chess player as a person who does not play chess by the rules (at least not consciously, anyway). The expert chess player performs "smoothly, effortlessly, and subconsciously" (Devlin, page 179). He operates on instinct, looking at the board and just knowing which moves to play. While this may seem strange, it is in accordance with how many chess masters and grandmasters describe their thought processes during a game. Chess experts often say that they don't really calculate far into the future. Rather, they just look at the board and they instinctively know which moves to make.

Gobet and Simon studied tournament matches of grandmaster Kasparov to see if time constraints affect the level of play of expert chess players. Their study found that time and look-ahead searches did not play a significant role in Kasparov's game play. Under typical tournament conditions, a player is allowed three minutes for each move. In the tournaments studied by Gobet and Simon, Kasparov played rapid chess against 4-8 simultaneous opponents. Kasparov was allowed an average of around 30 seconds per move while his opponents were allowed the usual 3 minutes per move.

At the time of the tournament, Kasparov was the highest rated chess player in the world. Despite playing simultaneously against several other top players under significant time constraints, the study found that Kasparov consistently played at the level of a very strong grandmaster. In fact, Kasparov played nearly just as well as he did under normal

tournament conditions (Gobet and Simon, page 9).

Gobet and Simon's research implies that the level of play of a grandmaster does not change drastically when under serious time constraints. Furthermore, no correlation was found between the number of opponents and level of performance (Gobet and Simon, page 9). Studies done by Calderwood & al. in 1988 also support the theory that time restraints do not drastically affect the level of play of chess experts (Gobet and Simon, page 6).

A study done by De Groot in 1946 found that strong and weak players examine nearly the same amount of number of branches when searching ahead for moves. Furthermore, in 1949, De Groot found that top-level grandmasters do not search reliably deeper than amateurs. There have been a number of other studies and experiments done by De Groot that support the idea that chess experts do not search deeper than average players. But if this is the case, then what is it that makes chess experts so good at chess?

Research has shown that chess experts have remarkably good memory when it comes to recalling specific games and positions (Gobet, page 1). Experiments have shown that a normal position with 25 pieces takes as little as 5 seconds for a chess grandmaster to store in his memory. Under the same conditions, weaker players can only recall half a dozen or so pieces. However, if the chess pieces were put on the board at random instead of being taken from an actual game, the grandmasters lost their superior memorization skills and performed no better than the weaker players (Gobet and Simon, page 4).

After analyzing the evidence, it was concluded that masters and grandmasters recognize and store familiar patterns of pieces that they've seen before. When the chess master encounters a position that seems familiar to him, he can access the knowledge

index in his long term memory in just a few seconds (Gobet and Simon, page 4). Thus he relies on pattern recognition and prior experience to tell him which pieces are important, which weaknesses he can exploit, and which moves are the most beneficial. So instead of tediously calculating every possible variation, the chess expert is able to use pattern recognition to filter and shorten the look ahead search.

Even though a strong chess player examines the same number of branches as a weak player, the strong player is able to concentrate his focus on more relevant branches because he can recognize significant features. He does not worry about the pieces that are unimportant. This is the distinguishing feature between good players and great players. Great players are able to recognize the important aspects of a position and thus they are able to focus their attention on more relevant pieces.

But the question still remains: how do you make the transition from a good player to a great player? The evidence suggests that pattern recognition is a very important tool to help you refine your look ahead searches and focus your attention to the more relevant parts of the game. One who wishes to acquire skill at chess should keep this thought in mind. Trying to calculate your moves far into the future can overwhelm you and distract you're attention away from the more important parts of the chessboard. Instead, focus on learning how to recognize the significant features of different positions.

The most important aspect of acquiring skill at chess is experience. The more experience you have playing, the more positions you learn to recognize and be comfortable with and the greater your index of knowledge. With enough experience, you will be able to react instinctively when playing chess. You wont have to calculate your moves far into the future, you will just know which moves are best. You will be a chess expert.

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