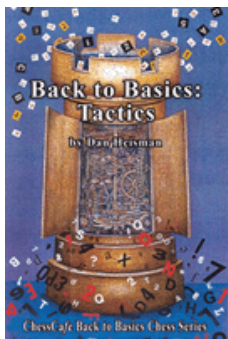




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Dan Heisman



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The Fundamental Theorem of Safety and Activity

Quote of the Month: *Tactics is the science of chess safety.*

In [The Big Five](#), I list five areas of improvement for getting weak players up to the strong intermediate level: safety/tactics, activity, time management, thought process, and understanding and prioritizing general principles.

Of these five, only safety and activity are on the chessboard. On a scale of 0-100, I rate the importance of each concept on the chessboard as follows:

- Safety 100
- Activity 15
- Everything else <1

Many years ago I taught a basic calculus course at a local college. As someone with a math degree, I was familiar with the fundamental theorem of calculus, which states that differentiation and integration are inverse functions. This is such a key concept that I felt I had to know it inside out, so I took a couple of texts and spent an interesting hour reviewing the proofs of that theorem until I had a firm understanding. It is curious that two operations which in two dimensions determine slope and area would be inverse, but they are and I wanted to make sure I understood it well enough to teach it.

Now, over twenty years later, I teach chess. In doing so, I have discovered that *safety and activity are related in a similar manner to differentiation and integration*. It is not a perfect analogy, but it is close enough to merit attention. Consider the following two questions:

- Why do you want to capture your opponent's pieces? Answer: If you capture them, and so demonstrate they are unsafe, then "off the board" those pieces can't do anything to help your opponent or harm your pieces. In other words, you permanently prevent your opponent's ability to do anything with that piece. Therefore, you make them unsafe so they can't be active.
- Why do you want to restrict the movement of your opponent's pieces? Again, if they are inactive, they can't do much to harm your pieces.

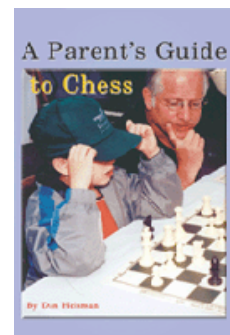
But what do the answers to these two questions tell us? A piece that can never do anything is similar in power to a piece that is off the board. This concept was first brought to light in [Chess Principles and Common Sense](#), but here I want to take it one step further. This does not require a big leap of logic and represents a "chess truth":

The Fundamental Theorem of Safety and Activity

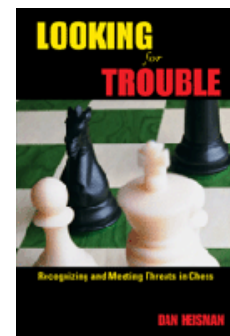
The reason that you want to keep your pieces safe is so they can be active (do something positive for you); the reason you want to keep your opponent's pieces unsafe is so they can't be active (do anything positive for your opponent).

Think of non-safety as the ultimate inactivity. Similarly, *the reason you*

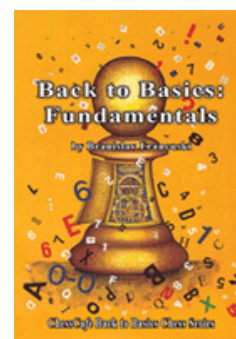
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want to keep your pieces active is so they can do something positive for you; the reason you want to keep your opponent's pieces inactive is so they can't do anything positive for your opponent.

But this means that safety is related to activity! Another way to view the Fundamental Theorem is:

There is no sense keeping a piece safe if you are not going to make it active, and there is no sense activating a piece if you are not going to keep it safe. In either case your goal is to keep that piece doing something for you.

I can state without reservation that a player who understands this deeply, and does his best to consistently maximize the safety and activity of his pieces (and minimize his opponents) is well on his way toward becoming a good player.

What about a sacrifice? A sacrifice allows your remaining army to do something more than they could when the sacrificed piece was on the board. If you make a "sacrifice" and it does not help activate your pieces or restrict the opposing forces that sounds more like a blunder! As Dr. Tartakower said, "It is better to sacrifice your opponent's pieces!"

The end goal is checkmate, and *making your army as powerful as possible with the idea of winning material (and then checkmating by attrition) or directly checkmating with equal or less material are the fundamental end goals of not only tactics, but all strategy, planning, and positional play* (Note: but not [The Goal Each Move](#)).

That's why activity has a special place in all strategy, planning, and positional play (see [Activity is the Real Goal](#) and [Evaluation Criteria](#)). I once heard someone say that Kasparov, when asked about the role of activity in chess, responded something like "Chess is all about activity," which, in a way, approves the Fundamental Theorem of Safety and Activity.

Think of winning pieces as the ultimate way of making your opponent's pieces inactive. Similarly, keeping your pieces safe is a necessary prerequisite toward making them active. Once all the pieces are safe and active, only then do you usually concentrate on making them stronger (more active), which leads to many principles of safety and activity. This logic was discussed at length in [Chess Principles and Common Sense](#).

In light of the above, a good tip is to view your army's activity as a type of safety issue. Moreover, a well developed and coordinated army is safer, and that is not a coincidence (see [The Inadequately Guarded Piece](#)). When pieces are active, they have things to do, and a strong, active army is less likely to have a tactically exploitable weakness than an uncoordinated and undeveloped army. Uncoordinated pieces are less likely to be protecting either each other or the squares the other piece attacks; pieces without mobility (the raw number of moves) are more easily trapped, etc.

The key is that you need to activate your entire army, not just a piece or two or three. The fact that you should mobilize your entire army in the opening (usually excluding the king because of safety issues) and the fact that you must mobilize your king as soon as it is safe to do so are just different implementations of the same principle.

It is also not a coincidence that Steinitz' rules imply that if your opponent's army is doing more than yours, he has the following advantages:

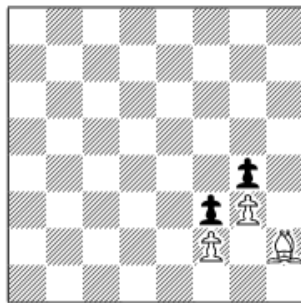
- He can justifiably attack
- He has more tactical chances, and

- He will have more flexible plans.

It takes a lot of activity to make up for a little material – this is like the $E=mc^2$ of chess where, in place of mass, we can use material and, in place of energy, we can substitute activity. At the start of the game, when the pieces are not yet clashing, it takes a pawn to equal about three tempi or possibly two tempi and an extra semi-open file. Later in the game the chess equivalent of the conversion factor (c^2) shrinks; it may be possible to give up material for one key tempo or open line, especially if the opponent's king is involved.

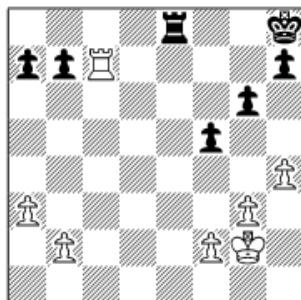
We can ultimately filter all types of positional aspects of chess into how they fit into the activity and material balance. As stated in [Activity is the Real Goal](#), positional aspects like space, pawn structure, control of files and diagonals, etc. can all be broken down into the question of how much activity they grant both armies, their affect on the remaining material and, ultimately, the expected outcome of the game.

This ends the heavy theoretical stuff. Now let's lighten up with a basic but extreme example. Believe it or not, my son once trapped his own bishop in the following manner during a tournament game:



Unless White can win the black pawns, that bishop is almost 100% useless (activity) – and worthless (material). His opponent, a good player, treated the position as if he were ahead a piece, traded off almost all the other pieces, was left with one more active piece, and won easily.

Another practical application:



Black to play

Rooks belong on the seventh rank. This is a positional guideline that is not always true, but quite often so.

Here White has his rook on the seventh rank, but how does that translate into an advantage? Weaker players simply think that Black can always just guard the attacked pawn with $1...Rb8$. But here

we see a fundamental tradeoff between material and activity. If Black does play $1...Rb8$, then Black's rook will be passive, White will get some free tempi to activate his king, and Black's king will be cut off and much less active. Therefore, White will have both a more active ("stronger") rook *and* a stronger king.

In rook and pawn endgames there are three types of advantages one can possess besides material:

- A more active rook
- A more active king
- A better pawn structure

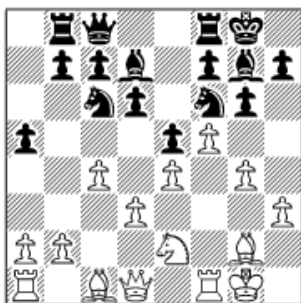
A helpful guideline states that *if you are in a rook and pawn endgame with even material and have one of the above advantages and the other two are equal, you have the initiative* (more relevance to Steinitz' rules!) Moreover, *if you have two advantages and the third is equal, you are usually winning.*

Applying that rule to the above position, we can conclude that if Black passively guards the pawn on b8, then he is likely losing. This is in harmony with another applicable guideline: *If you are in a rook and pawn*

endgame and have a choice between a passive position that is even in material or an active position down a pawn, it is usually better to choose the latter.

Using this principle, Black would love to counterattack. However, in this example doing so immediately is very difficult. Therefore, it will take some care, but eventually White should be able to convert his extra activity into extra material, and eventually into a win. For example **1...**
Rb8 Better is **1...b5!? 2.Rxa7 Rd3 3.b4** and White is winning, but at least Black is more active. **2.Kf3 a5 3.Kf4 h6** Or else **3.Kg5. 4.h5 gxh5 5. Kxf5** and White is well on his way to winning, e.g. **5...Rf8+?! 6.Kg6** and the threat of mate preserves all the white pawns as Black's kingside pawns fall.

Let's try an example from the English, where if Black plays poorly White can trap a piece: **1.c4 g6 2.g3 Bg7 3.Bg2 e5 4.Nc3 d6 5.e4 Nf6 6.d3 O-O 7.Nge2 Nc6 8.O-O Be6 9.f4 a5(?) 10.f5 Bd7 11.h3 Qc8 12.g4 Rb8?**



White to play

13.g5 Traps the bishop. **13...Ne8 14.f6 Bh8** and, similar to my son's game, the inactive piece is almost as bad as a lost piece, although in this case, Black can at least sacrifice it for a pawn at any time.

Safety and activity, activity and safety, yin and yang – is it any wonder that instructors are forever trying to get their

students to learn tactics and get all their pieces into the game? The one with the most power wins. In beginner games it is material preponderance that wins. In grandmaster games the subtle disparity in the strategy or slight imbalance between the forces may eventually tip the scale in one side's favor. But most readers fall in-between – they don't readily lose their pieces, but don't "in-their-gut" realize how all-important it is for each one of those precious forces to strive for their maximum activity at all times. While inactive pieces may not always cause loss, more often just one or two inactive pieces are enough for the tide to turn in favor of the opposition.

Safely and efficiently activating *all* of your forces is the key goal of the opening. Don't have a "better idea" and play the opening like the middlegame – it is usually much more efficient to activate a piece that is doing nothing than take a piece that is doing something and try to make it do more (or worse, make easily met threats – see [The Three Types of Reasonable Threats](#).)

In the endgame the piece that needs activating is the king. Almost all my students know to activate their king in the endgame. Although the king has infinite trading value, it has about four pawns of fighting value, and it should be activated as soon as it is safe to do so. Yet for some reason – just as in the opening – weaker players are often neglectful in bringing that "last piece" into the fray, and wait too long.

When my son was rated 1000 he found that he could win lots of games just by trading everything off and being the first to activate his king. As he improved, he found that more and more players at the higher levels knew about this "secret," and his winning formula did not result in as many easy victories. Hopefully this article will help bring more victories to the reader!

Question I enjoyed your article on [The Inadequately Guarded Piece](#). I have always thought of "loose" as N attackers, N defenders. That is, "loose" is $NA=ND=N$. Then "undefended" is just a special case of

“loose” with NA=ND=0.

Answer Yes, you can define “loose” that way – there is no universal dictionary of chess! I primarily wanted to show that in some circumstances pieces that are guarded can be in even more danger than pieces that are not guarded, and the players’ perception of what is safe should not be primarily based on whether a piece is guarded or not.

Question How do you overcome the fear of playing stronger players? And how do you overcome the fear of playing in tournaments where the competition is fierce? And most of all, how do you overcome the fear of losing?

Answer Fear of losing is a common barrier, and overcoming such barriers is an important issue in chess improvement (see [Breaking Down Barriers](#)). Although everyone tries to win and likes winning, if your goal is to improve it is far better – and usually more interesting – to play stronger players who show what you need to know, rather than “be a bully” and beat up weaker players. My love of learning exceeds my fear of losing. I would much rather lose and learn something than win and learn nothing. That is also a principal reason why, if time permits, I ask each opponent to review the game with me.

My goal in playing is to test myself to play the best move I can, each move, given the time available. This is why time management is so important. If I can do that, then the result is rather secondary. I would rather play a stronger player where I play well each move and yet lose, than play a weaker player and win while making mistakes where I should know better. Therefore, my happiness is related to my relative effort and my learning, not the result. If I felt I played my best and learned something, then that is truly a good game.

One should always seek out challenging opponents. Ideally, about 65% of your games should be with opponents rated 50-300 points higher than yourself. Higher ratings than that are not only unnecessary, but often discouraging. But if you do so, you will lose slightly more than you win, so learning to lose is part of learning to play well (see [The Ten Biggest Roadblocks to Improvement](#), #6).

You can only do your best. If you can look in the mirror after each game and admit that you tried your best each move, what more can you ask? No sense crying over spilt milk – you can only affect the future, not the past.

Question In [The Inadequately Guarded Piece](#), you wrote “always consider all your and your opponent’s safe checks first!” Does this mean consider checks for both sides, and then captures for both sides and then threats for both sides, or checks, captures and threats for one and then checks, captures and threats for the other?

Answer Neither! As you allude – the statement is a little too general. When it is your turn, you have to look at *your opponent’s previous move*: it may be a check or a capture, or it may contain several threats. What my statement means is that later, when you are looking for *your candidate moves*, you should first consider all your checks and keep as candidates the safe ones (before you consider your captures and threats). Finally, when you are trying to determine whether a candidate move is safe, in order to do so you need to consider *your opponent’s possible replies*, and there you should consider his (safe) checks first, etc.

So my sentence was a shortcut meaning: “At the appropriate time during your thinking process where you are considering your candidate moves and your opponent’s possible replies, start with the safe checks first.”

Question While doing the second problem in the [February 2008](#) column, I evaluated the sequence of captures 1.Bxd7 Rxd7 2.Qxd7 Rxd7 3.Rxd7

as favorable for White, as it leaves him a full rook up and with Black having no pieces. I was wondering, is deliberately sacrificing material for an easy endgame a tactic? If yes, what tactic?

Answer That's only if you assume the position with no kings is legal.

As I occasionally explain, when kings are purposely left off the board, it is to avoid distracting the reader from the primary issue at hand. *Without kings on the board, the reader should assume that otherwise everything else (material, kings, etc) is equal.* Some authors use my device; others "cut" the board and only show a subset of squares to indicate the same thing: that you are not seeing the entire position. Therefore, you can't count the number of pieces left on the board in such a problem, since you don't know the location of the other pieces.

For example, if we assume both sides had their full compliment of pieces before your trade (kings and other pieces purposely not shown), then you are trading a bishop and a queen (worth about thirteen pawns according to Larry Kaufman) for two rooks and a pawn (worth roughly eleven pawns). That means the remaining material on the board shows a two pawn deficit for you, since you just lost two pawns. Since White has no better sequence for possibly capturing the pawn, the pawn is safe.

On the other hand, if we assume the only other pieces left on the board were the two kings and White was way ahead in material to start, then your sacrifice of the two pawns to achieve an endgame ahead just a rook would be good technique.

Dan welcomes readers' questions; he is a full-time instructor on the ICC as Phillytutor.

[Yes, I have a question for Dan!](#)

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