Difficulty in Beat Saber Maps

by GalaxyMaster

I'm a big proponent of high difficulty mapping. You might be able to tell from the kinds of maps I make. That being said, I will now tell you why difficulty actually sucks.

Difficulty Bad

Ever seen a really cool map with great representation and unique ideas, only to try playing it and getting absolutely destroyed? Yeah that's a bit disappointing. That is where we find the primary reason difficulty is a bad thing: it limits the target audience. The higher the difficulty level, the more severely the audience is limited. Fun maps are only fun when you are actually able to play them. When they're outside your range, they are at best cool art pieces to look at, or watch someone else play.

Difficulty also adds no inherent value to the map. A map isn't better *because* it's hard, it's just hard and that's it. In fact, many forms of difficulty actively take away from the fun in playing. An easy example is ridiculously high NJS. It adds difficulty, but the map becomes less fun. This is because it forces you to focus on that element of difficulty, thereby taking away from other factors that make the map enjoyable. It's also because some forms of difficulty inherently are not fun for most people, since they clash with the core experience of the game.

So why do we have difficulty at all then? Is difficulty inherently bad, and should we avoid making hard maps? Not quite.

Difficulty Good?

There is one very important reason to have difficult maps: experienced players need to be challenged. If you are a competitive player and everything is easy for you, the game gets boring quickly. Difficult maps exist so players of higher skill levels are still able to enjoy the game in the same way as newer players do.

So maybe not so much that difficulty is good, but more that it is required to keep the game interesting. A necessary evil then? Well, there is more to the story.

Mapping for Difficulty

It is often said that mapping for difficulty is something to be avoided. That it will result in a worse map that can be enjoyed by fewer people. Largely, this is correct. If your main goal is to make things difficult, the likely outcome is that you will end up sacrificing fun and overall quality in the process. Combine that with the inherent downsides of difficulty, and you end up with a bad idea.

However, there are actually good reasons to make maps where you intend for a high level of difficulty. The key here is to realize that difficulty is not the goal, but rather an allowance. Your target level of difficulty is ultimately a limiting factor in mapping. There are things you might want to do, but can't because they would end up being too hard. By raising the target difficulty, you can gain more freedom in your mapping. This greater freedom can give rise to greater creativity, more unique and fun ideas, and allow for a more complete representation of the song. Simply put, with higher difficulty, the map can do more.

That being said, not every song naturally allows for high difficulty mapping in some or all of its parts. Forcing difficulty where there simply isn't enough going on in the song quickly degrades the map's quality. In addition, sometimes the best way to map some parts of a song can end up being too easy to fit with the rest of the map, even when the song overall does support a high level of difficulty. That's why it's important to consider the entire song, as well as what you want to do in each part, when choosing a target difficulty level.

One other good reason to consider a high target difficulty is that it's a very good way to get better at mapping. You have more freedom for ideas, so creativity flourishes. There will inherently be more going on, so the quantity and density of ideas will need to increase as well. Playability issues become more apparent at higher difficulties, and also become way harder to avoid, so you will be forced to get comfortable with recognizing and solving them. Yes, this does mean making it good requires more mapping skill. But it also means your mapping skill will improve much faster when you do give it an honest try.

The ceiling for how good a map can be is pretty directly tied to difficulty. It's no coincidence that my best maps are also among my most difficult. This has historically been the case for my whole mapping career, and will almost certainly continue to be true in the future. I think for a lot of mappers, especially on the more competitive side, their answer will be the same.

With that in mind, not all forms of difficulty are created equal. As I alluded to earlier, some forms of difficulty are inherently unfun for most players. What makes some forms of difficulty good, and others bad? What forms of difficulty should you consider when making hard maps? That's what I'll talk about next.

Forms of Difficulty

The way I see it, all forms of difficulty can be sorted into 2 categories: reading, and execution. Let's start with the former.

Reading

Reading difficulty is anything in the whole process of translating what you can see into motions you need to perform. This includes reading timings, determining hit order, parsing swings of multiple notes, determining parity, recognizing the angle to swing at, and more. Difficulty can be introduced in any of these elements in various ways, but there is one important thing they all have in common. In my opinion, reading as the main component of difficulty is inherently bad for a competitive setting.

The reason for this is simple: any amount of reading difficulty can be overcome through map memorization. This means that reading can never be a true skill check, since you can simply remember what to do to nullify it entirely. If reading is the main reason someone cannot play a map well, all that does is encourage them to memorize the map. Some may disagree, but in my opinion memorization is not what this game is about, and I consider it an active hindrance when it comes to having fun.

The conclusion to draw from this is equally simple: the main form of difficulty in a map should never be from reading. Reading difficulty should be limited to a level that you can expect people to be able to handle when they are at the skill level required to physically play the map.

What about those who *can* read it?

Of course, just because reading is the most difficult part of a map, that doesn't mean nobody can read it. They don't need any memorization and can simply enjoy the map as-is, so is it really a problem? Can't the other people just not play it? I have two answers to this.

First, when reading is the most difficult part of a map, then by definition most of those who can read it are above the skill range for actually physically playing it. Since reading is a fairly binary thing, either you read it or you don't, you just end up with a pretty straightforward map for those people. You essentially lock out the players who are actually within the map's skill range, which kind of defeats the point of high difficulty mapping.

Second, while people *can* just ignore the map and play something else, this does not entirely solve the issue. In a competitive setting, when the optimal move is to do something unfun, it is universally a bad thing, and I consider it a failure of the system. That is exactly what happens here. Players are incentivized to memorize the map, because doing so is the most competitively

optimal thing to do. They now have to choose between competing and having fun, and that's something that should never happen.

Of course everyone has somewhat different skillsets, and there will be some people for whom reading is not the hardest part of the map. However, most people will fall close to the average. There is also a good amount of gray area where reading is a significant component of the difficulty, but not yet overwhelming. Here you will have some people struggle with reading most, and others with execution. The greater the reading difficulty relative to execution, the more problematic it becomes. Should you want to, you can thus generally still end up with a balance that provides a good amount of reading difficulty, while avoiding most of the problems it can bring.

What if it's only a small part of the map?

If it's only a small part of the map that is hard to read, then memorization may not be such a big issue. You can just go in practice mode once or twice to learn the patterns in question, and that's that. Some people might even find this fun. However, consider what this means for sightreading.

You're on a good run, able to play the map pretty well, having fun. Then out of nowhere an unreadable pattern hits and your sightread is ruined. That's not a great experience. As the mapper you then have to ask yourself, is this actually worth it? Does the map really need this small unreadable part, or is it better off just being changed? In my opinion, the answer is almost always the latter.

One possible exception would be when some pattern is inherently not sightreadable, and there is no way to improve it without destroying the pattern entirely. Then it becomes a tradeoff to consider, and in some cases it could be justified to keep what you have. However, in a competitive setting this bar for justification will be higher, so it becomes significantly less likely that will end up being the case.

Generally speaking, reading difficulty does not need to exist

As a mapper, I find that in almost all cases, it is possible to make patterns properly readable without sacrificing much if anything in the other aspects. It is rare to have patterns where this is simply not possible, and when you do have such a case, I believe you can generally just replace it with something equally interesting that does not suffer from readability issues.

With that in mind, if it can just be eliminated, is excessive reading difficulty ever really justified? I would say, outside of niche audiences and gimmicks, it generally indeed isn't. Personally, I view reading difficulty more as a flaw of the map than anything else. Its existence is just a result of the mapper's inability to fix it, rather than a genuine component of the map.

If you enjoy memorization and like the rewarding feeling of playing something that should not be readable, then of course all this doesn't apply to you. However, when considering a competitive setting, I believe that this represents a small minority of people, and you have to take into account how it impacts everyone who doesn't feel this way.

Execution

Execution difficulty is anything that has to do with physically performing the movements necessary to play the map. There are many aspects to this, and I will detail a few below.

Precision

This would include anything that requires precise movements in some way to hit properly, having small margins for error. This can be:
- Precision bombs, which punish the player for straying off the cut path too far
- Badcut patterns, which require you to carefully avoid swinging through a note of the opposite color
- Wide swings, which due to the way the geometry works out, drastically reduces the effective timing window and requires higher timing precision, as well as being harder to aim
- High NJS, which obviously directly reduces timing windows and so requires more precise timing

You may notice that some if not all of these are generally considered to be bad things. Indeed, it is my opinion that any difficulty stemming from enforced precision is generally a negative. People sometimes refer to this as "artificial difficulty", though this can also more generally refer to difficulty without a real purpose.

Physical Awkwardness

Essentially, avoiding handclaps, face punches, arm tangles, etc. Anything that requires you to put in extra effort to avoid collisions or physically impossible movements. I don't think it needs to be said that this is a bad form of difficulty.

Unnatural Movements

Anything that goes against what your body "wants" to do, so things like extended lean, sustained palm up, big rotations with anti-setup, etc. These all require you to perform movements that you normally wouldn't want to do, but are still possible with a bit of effort and technique.

This is likely where opinions will diverge a lot. Some may find them uncomfortable and unenjoyable, adding little to the map. Others might love the feeling of staying in control while pushing physical limits. Personally, I think it does have value and can add a lot, but it should be done carefully and with clear purpose, and not be the default state of a map.

Physical Intensity

This is difficulty that stems from how much effort or energy the movements require. The simplest form of this is just speed; swinging fast takes more energy than swinging slow. But speed alone is not the whole story. The size of movements is also a huge factor.

At its core this is about taking natural movements, and then pushing those further. Well set-up rotations made bigger, larger circles, more repositioning, and all of it at higher speeds. It is the combination of bigger movements and making them faster that really drives up the intensity of a pattern.

It's important to distinguish this from unnatural movements, which can also require more effort to play. The key is that physical intensity is independent from unnatural movements, though they can often work together and both contribute to the difficulty of a pattern. In its purest form however, physical intensity consists entirely of natural movements, and does not require any awkwardness to be present.

Physical intensity also ties in really well to this game's accuracy system. The more intense a movement is, the harder it gets to be accurate with it. It is very scalable, and can provide meaningful difficulty to anything from your basic Expert diff to the very hardest maps available. There is effectively no cap for how far you can push it.

In my opinion, this is the best form of difficulty available, both for competitive and more casual play, and should contribute the majority of difficulty in a map. This is also what I try to focus on in my own mapping, and I find it to be the most fun and "fair" form of difficulty when playing the game myself.

Keeping Time

This one is a bit harder to place, as it could be considered to be a combination of both reading and execution difficulty. Nevertheless, I am placing it here and will give it some attention.

Generally speaking, this applies to fast and static patterns. The lack of additional movement makes it harder to feel the rhythm, which can cause you to lose time. The faster a pattern is, the more mental effort it requires to keep this rhythm feel going. This can be a major component of difficulty in more linear speed maps, where the difficulty lies more on the execution side of things. On the other hand, it can also be the result of hard-to-read or unnatural patterns, which would place it more on the reading side.

I don't find this to have much inherent value, but I also don't mind it very much. I think it is not so much a form of difficulty to target, but rather something to be aware of when mapping patterns. That is just my opinion however.

Gimmicks

This is where I'm going to turn a lot of what I've just said on its head. Gimmick mapping is when a map focuses solely on one specific concept or form of difficulty. In gimmick maps, you don't have one specific form of difficulty taking away from the fun of the map. Rather, that form of difficulty *is* the fun.

As such, it can nullify some of the downsides of difficulty, with the tradeoff being an even more limited target audience. Not only do people need to be able to play the map, they also need to enjoy the gimmick that the map is built around.

As for the types of gimmicks that tend to be made, they tend to reside either in reading difficulty, enforced precision, or unnatural movements, though in theory any form of difficulty could serve as a gimmick. A well known example of gimmick mapping would be Ludicrous Speed, being built around the infamous horizontal spiral gimmick. It has its main difficulty in both unnatural movements and enforced precision, and shows how gimmick mapping can push a map's difficulty quite high in some cases.

Personally, I think gimmick mapping can be great fun and result in some really unique creations, so long as they are still made well and the gimmick does not get in the way of other important aspects of map quality. I also think they do have a place in a competitive environment, though they should always be a minority of the maps available. All the previous statements about reading difficulty do still apply though, so reading-based gimmicks are perhaps best left out of competitive play, at least in my opinion.

The Case for Extremely Difficult Maps

In this section I will try to convince you that not only do we need hard maps, we need to go further. Much further. I believe the current top end of difficulty in ranked is far too low, and this is actively harming the competitive side of the game. If you are skeptical of this claim I would understand. However, please give me the opportunity to make my case.

Why current top maps aren't hard enough

At the time of writing, the top maps on ScoreSaber and BeatLeader sit at approximately 13 and 14.5 stars respectively. Both have a top play with Full Combo and accuracy well above 96%. Even the literal most difficult maps ever ranked are well within the skill range of some of the top players. In other words, *there does not exist any map that actually challenges top players to the extent that most of us can experience.*

When every map is FCable, the game changes. Most players have a choice to either focus on getting better accuracy on easier maps, or playing harder maps more effectively, learning to hit more difficult patterns. Top players do not have this choice. Accuracy is the only way for them to get better scores on ranked maps, and so it is the only thing they can focus on if they want to climb ranks and improve.

Personally, I enjoy the game most when I play maps where I struggle to get 90%. If I was only able to play maps where a 96% is achievable for me, I would quickly become very bored. I believe this is a significant part of why top players tend to experience burnout from the game.

Taking myself as an example, I am currently at the point where I can just about play (some of) the hardest maps in ranked. Putting a lot of effort into the score, I could probably get around 88% on them. In my opinion, this is about the right range for difficulty to be available to players. Much harder than this and I would struggle to play the maps at all. Much easier and I would find myself getting bored only being able to play maps that are not much of a challenge to me.

What would maps look like if the equivalent range was available for top players? How hard would the top maps have to be to give them the same range of choice I have? Since pp is directly proportional to star rating at any given % score, we can do a simple calculation to get a rough estimate. Taking the total pp of the current rank 1 player, and dividing it by my own total pp gives us a pp ratio. Multiplying the current top star rating by this ratio should then give us the theoretical star rating necessary. Doing this results in a value of **20 stars** on ScoreSaber, and **23.5 stars** on BeatLeader. As you can see, that is very far away from where we are now, and it should serve to illustrate just how different the situation is for top players.

But what about challenge maps?

Some might argue that challenge maps can fill this gap. They reach way higher levels of difficulty and could be used for further practice by top players beyond what ranked has to offer. To some extent, that is probably true. However I believe they are not a proper replacement.

Challenge has a fundamentally different focus, for both playing and mapping. The main goal is simply to pass a map, rather than get a good score. Because of this, maps tend to not be very "fair" in their mapping, and difficulty usually exists for its own sake, rather than being used for

better representation or more creative ideas. The overall experience is simply not comparable to equivalent difficulty in a non-challenge context.

But what about modifiers?

Since BeatLeader supports modifiers on ranked maps, you could argue those can fill the gap at the high end. However, similar to challenge maps, this is only partially true. Ignoring the fact that they are not supported on ScoreSaber, where currently the majority of competition is still focused, modifiers suffer from some pretty major drawbacks.

The only modifiers that are actually viable for use are Faster Song and Super Fast Song. Both are simple speed modifications of 1.2x and 1.5x respectively. While making a map faster does make it more difficult, and the difficulty is somewhat accurately reflected in the star ratings, this is by no means a perfect solution.

One of the biggest issues is NJS, which gets scaled linearly with the song speed. This very quickly leads to stupidly high values that would never be used in a real map, and often makes them quite unplayable. Even aside from NJS, simply making maps faster has some more fundamental problems. Maps are designed to be played at a specific speed, and changing it can have very mixed results. Vision can become a major issue, flow can become janky, speed diffspikes become highly exaggerated, parts can become nearly unhittable while others stay pretty easy, etc.

With all this added up, the end result is that only a very limited selection of maps actually becomes viable to play. Maps with modifiers are harder, yes, but they simply aren't *good*. Worse still, even with the hardest maps currently ranked, FS does not get you far above 16 stars. The only way to get higher is to use SFS, which suffers much more severely from all the aforementioned issues. So while modifiers do help, they are by no means a replacement for proper high difficulty mapping.

Avoiding another Ov Sacrament situation

Ov Sacrament is probably the most infamous map in the game, and for good reason. It was the top ranked map for a very long time, with nothing even coming close until relatively recently. On top of that, it was also not very well made, and remaining the top map for so long made it age very poorly. Over time it went from disliked, to hated, and eventually to meme status, all the while remaining solely at the top. Its existence was widely considered problematic, and inspired several measures to avoid similar cases from happening again. How do we know we won't end up in this situation again? If we start pushing for harder and harder maps, won't they become the new Ov Sacrament? I believe this is not as much of an issue as you might think.

We've moved on from PPv2

A huge part of what made Ov Sacrament so problematic was the way the ranking system worked at the time. Accuracy was not rewarded much at all, and the focus was more on the passing side of things. The only real way to get more pp was to play harder maps, and so the very hardest maps effectively became must-plays for anyone who could pass them. Ov Sacrament was at the top of almost everyone's front page, not because they could play it really well, but simply because it was the hardest map available. With everyone being forced to play this one map, which also wasn't very well made, it's easy to see why people began to greatly dislike it.

However, things have changed since then. Accuracy is now rewarded well, and it has become viable to completely ignore the hardest maps and instead focus on playing easier maps better. A map being higher star does not automatically mean it will give more pp, or become another must-play. Players have the freedom to choose what they want to play, without greatly sacrificing their ability to compete. Thus, another true Ov Sacrament situation is not actually possible in the current system. The worst that can happen is that a map is severely overweighted, but this can happen at any difficulty level (as has been seen several times recently).

Ov Sacrament was an enormous jump in difficulty

It shouldn't be understated just how big the gap was from Ov Sacrament to the next highest map. And it's not like the range was more filled out beyond that either. Top maps were few and far between, and the steps in difficulty from one to the next were very large. Today the situation is much different, and the slope to the highest ranked maps is much less steep. By avoiding huge jumps in difficulty, many of the problems that can come with it are also avoided. Instead of jumping straight to 20 stars, we should build up to it in regular intervals.

People have gotten a lot better at mapping in general

The general mapping skill, and especially knowledge of problematic elements has increased tremendously over the past years. Many of the biggest problems with maps from that time are now easily recognized and avoided. As with anything, mapping has diminishing returns. The difference between maps from 3 years ago and maps from today will likely be much bigger than the difference between maps from today and those from 3 years in the future. This also means that potential problems that we will later realize are going to be much less significant. The potential for maps to age poorly has simply decreased a lot, and will continue to decrease over time.

You don't need to FC a map to give proper feedback

Even if you aren't good enough to FC it, there is still plenty you can say about a map's quality. In fact, often the best feedback comes from those who struggle with it slightly. People who can play it all comfortably might overlook some issues that other players would encounter, simply because they can overcome it with their skill. In addition, a huge part of map quality is independent of difficulty. The main thing that can change is how impactful any problematic parts are, and the potential for new problems that haven't shown up in easier maps. With a bit of diligence and care, I believe this will not be a major concern.

Ensuring difficulty exists for the right reasons

As I have explored above, there exist many ways in which a map can be difficult, and many reasons why that difficulty can exist. The harder a map is, the more it can do, and the more potential it has to be a good map. Making sure the difficulty exists to allow for this greater potential, rather than for its own sake, as well as ensuring the forms of difficulty present are good and used well, will be key to creating good quality maps at extreme levels of difficulty.

Mapping above your own skill level

Mapping above your own skill level *is* something that can be done effectively, even if it is a bit more difficult. I have previously written some about this, which I will link here.

Maps are products of their time

It is near unavoidable that maps will always become worse with age. As knowledge increases and standards evolve, almost any map will have issues that only become apparent at a later date. You may think that is more reason not to make harder maps. However, that argument applies to maps across the whole difficulty spectrum. I believe it is not a good reason to simply stop making maps. Rather, we should accept that no map will ever truly stand the test of time. Some may come close, but eventually all will show their age. And that's okay.

Maps are made for players of today, and their primary concern should be for that alone. So long as people don't end up forced to play old bad maps, this isn't actually an issue, at least in my opinion. Just because a map is hard does not mean it will "need" to be played for a longer time (if that need ever exists at all). New maps can and should be made across the whole difficulty spectrum so there is always fresh material to play. All the more reason thus to keep making more and better maps. Don't be discouraged by what the future might reveal, instead march towards it knowing things will only keep getting better.