Pickleball Sound

Sound can be characterized in several ways but the three terms we should use when describing pickleball sound are “pitch” and “loudness” which is also known as “sound level”. The reality is that most sounds are combinations of multiple pitches and sound levels. You probably have heard of music notes such as “middle C”. When you tune a piano key to middle C it has the pitch of middle C plus components of higher pitch sounds.

Pitch is quite different from loudness or sound level. A faint middle C and a very loud middle C are both of similar pitch but different levels.

Pickleball sounds heard outside the courts are mostly the result of a ball hitting a paddle. The “pitch” we hear varies with the ball model and the paddle model but what we usually hear is near the pitch of music note C6 or two octaves above middle C. Again, this is independent of the loudness, so having an agreed upon way of measuring loudness is helpful.

To make this measurement, we need an agreed upon reference sound level and a set of units of measurement. An accepted unit of sound pressure is the Pascal but human hearing is quite sensitive so we will want to measure some pressure changes that are 1 million times weaker, which we can call a micro-pascal, which has been selected as the normal reference level for sound level measurements..

In addition to our hearing being sensitive we also has an amazing ability to hear and make sense of both very low levels, like tens or hundreds of micro-pascals, all the way up to a billion micro-pascals without incurring damage to our hearing. More on that later. Dealing with this wide range of pressures requires cumbersome arithmetic so it is usual to compare one level to another by using a base 10 logarithmic scale. Don't worry about forgetting high school math since we can just use the defined terms to easily compare any two sound levels, even if they are millions of times apart in level! The term we will use is the decibel and the selected reference for sound measurements is 1 micro-pascal which we set to equal zero decibels, or 0 dB as commonly written.

It also happens that humans perceive an increase of 10 decibels in sound level to be roughly “twice as loud”. This is quite helpful since we can then simply use a meter calibrated in decibels to take measurements and then easily estimate how the sound levels will be perceived. (You can read all about this in Wikipedia at: https://en.wikipedia.org/wiki/Sound_level_meter if you like)

A related problem pickleball faces is that humans are more “annoyed” by higher pitch sounds. A beeping sound is more annoying than a rumble sound even if those two sounds are of the same level. Tennis and some other common sport sounds are usually lower pitch than pickleball. One aspect of this reality is that paddles that vibrate a little slower, which is usually the case for thicker paddles, will produce a sound that is somewhat less annoying to the neighbors. As paddle technology evolves, it may be that more paddles become available with lower pitch sound production and these sounds should be less annoying.

So what does this all mean to us? Well, the quietest sounds some people (those with excellent hearing) can hear are about 20 decibels above the reference level of zero dB. A problem with that simplification is that human hearing sensitivity varies with “pitch” so the

threshold of hearing also varies. An agreed upon adjustment to this measurement method is to use a weighted sensitivity called the A curve and our meters usually have a reading capability of decibels adjusted for the A curve. This adjusted unit of measurement level is referred to as dBA or often as dBa.

Now we are ready to use the numbers for comparison purposes. Here are some points of reference from noiseawarness.org:

0 dBA The softest sound a person can hear with normal hearing
10 dBA normal breathing
20 whispering at 5 feet
30 soft whisper
40 quiet residential area on a calm day
50 steady rainfall
60 normal conversation
70 freeway Traffic
85 noisy Restaurant
90 shouted Conversation
100 nearby snowmobile
110 shouting into an ear
120 nearby thunder

As you know, at some level our hearing can be damaged. It is recommended that we avoid extended periods of exposure to levels above 80 dBa and above 90 dBa is considered dangerous according to OSHA standards. Loud music fans beware!

It happens that frequent pickleball sounds are typically about 70 dBa at about 100 feet away from the strike of the ball. If homes located that close to pickleball courts are in a “quiet residential area”, they are used to 40 dBa and PB is 30 decibels louder! Remember, each time you increase sound level 10 decibels it will sound twice as loud. So, 30 decibels is 10dB+10dB+10dB or twice as loud times twice as loud times twice as loud, or 8 times a loud! It that annoying? Probably.

Making sound level measurements requires calibrated accurate equipment. Do not rely upon sound level apps downloaded to your phone except for simple relative readings. A good sound level meter, like the Sper 840015, costs about $500 with calibration and it needs to have its calibration checked yearly or so.

What can be done to reduce complaints? First of all, courts that are expected to get lots of use should not be located close to homes! When we increase the distance to homes, things get better. Doubling the distance drops sound levels by 6 decibels in open areas and even more when there are obstructions to sound propagation like hills and shrubs. Barriers can help. A 10 ft high wall can provide about 10 decibels of reduction, cutting the perceived sound level in half. Higher barriers help even more. Using the quietest balls and paddles available can cut the sound as much as 10 more decibels or in half again, but many players will resist using other gear. Restricting play hours can also help reduce complaints.

Barriers can be absorbing or reflecting. The sound reflecting barriers (like that known as Acoustifence) are less expensive but they will send pickleball sound back towards the courts

and perhaps towards other homes. Absorbing barriers (like the sound blankets made by eNoise Control) are thicker, heavier and more expensive but they may be the best choice in some cases.

The reality is that most residential neighborhoods have background sound levels (known as ambient noise) close to 50 dBa. If all homes are 200 feet away or more, the expected sound level will be about 64 dBa. If a sound barrier and quieter balls and paddles are used, we soon approach the typical sound level of average neighborhoods, under 50 dBa. To do more is difficult since sound will travel over a sound barrier. The solution to that problem could be a roof, basically making the courts an indoor facility and adding greatly to the cost.

Determining what sound level is acceptable is not simple. Local ordinances can be consulted and sometimes this will set the specific sound level limits that apply but other times an ordinance will simply state that any repetitive sound must not be “annoying”, a difficult goal to achieve. Sound level predictions and neighbor tolerance predictions should be part of designing a pickleball facility.

Summary: pickleball sound levels within 100 feet of courts will usually be around 70 dBa with no sound reduction efforts applied, as loud a freeway traffic sound. At 200 feet, (using the 6 dB drop for doubling the distance) this level will be about 64 dBa. At 400 feet it will be about 58 dBa, quieter than normal conversation levels. With limitation of paddles and ball brands, this can be below 50 dBa and usually below local background level at that distance.

Adding a 10 ft. high barrier can drop that to below 40 dBa, a level below normal library sound levels. Even at 100 feet, where the sound level would then be about 52 dBa, this may be an acceptable sound level in many neighborhoods. This means that barriers and distance are the most effective tools. It also means that sound levels can be predicted in advance of having complaints so consider your location and work with your pickleball community to make the sport a welcome addition to a neighborhood.

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