Does fast charging affect battery life 6 phone battery questions answered

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But now that fast charging is so readily available for phones, we have questions: Can a high-capacity charger damage your phone's battery in the short term? Can it degrade your phone's power-storing capability over time? And what causes unnecessary wear and tear on your phone's battery anyway?

All mobile phones -- and most personal electronics and electric vehicles -- use lithium-ion (li-ion) rechargeable batteries. It's a tough slog to create batteries that last longer, because battery technology hasn't changed in decades. Instead, much of the recent progress in battery life has come from power-saving features built into devices and from making the software that manages charging and discharging more efficiently, so you sip power rather than guzzle it.

Unfortunately for mobile phones, the focus on extending battery life is generally on cars, satellites and your home's power system, areas where industrial batteries need to function far beyond the two or three years we expect from our mobile devices.

Another force working against our phones is their battery size. Compared to an electric car battery, a phone's power source is minute. For example, the Tesla 3's rechargeable battery has a battery capacity over 4,000 times greater than the iPhone 11 Pro Max.

The math gets a little complex because phone batteries are measured in milliampere-hours, while electric vehicle batteries are measured in watt-hours. But it's possible to draw equivalents. For instance, the Pixel 4 has a 2,800-mAh battery (or 10.6 Wh), and the iPhone 11 Pro Max reportedly comes with a 3,969-mAh battery (15.04 Wh). Meanwhile, the Chevy Volt uses an 18,400-Wh battery and a midrange Tesla Model 3 flaunts a 62,000-Wh battery.

That matters because the larger a battery is, the more battery-saving tricks there are to extend its life. For example, as you charge a battery, the voltage rises, putting it under stress, especially during the last 20% of the charge. To avoid this stress, electric car makers may charge new batteries just to 80%. Because of that larger battery capacity, the electric car still can still go an acceptable distance, while avoiding the stress of higher voltages. This can double the total lifetime of the car's battery.

Short of a major breakthrough in battery technology, improvements to our phone batteries will come from making the devices more energy-thrifty overall. (Here's a more detailed look at what's holding up the battery revolution.)

A conventional charger has an output of 5 to 10 watts. A faster charger can improve that by up to eight times. For example, the iPhone 11 Pro and Pro Max come with an 18-watt fast charger, the Galaxy Note 10 and Note

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10 Plus have 25-watt chargers in their boxes. Samsung will sell you an extra-speedy 45-watt charger for $50.

Here's why. Fast-charging batteries work in two phases. The first phase applies a blast of voltage to the empty or nearly empty battery. This gives you that blazing charge of from 50% to 70% in the first 10, 15 or 30 minutes. That's because during the first phase of charging, batteries can absorb a charge quickly without major negative effects on their long-term health.

You know how it seems to take as long to fill up that last 20% or 30% of the battery as it does to charge the first 70% or 80%? That last part is the second charging phase, where phone-makers have to slow down and carefully manage the charging speed or else the charge process actually could damage the battery.

Arthur Shi, a tear-down engineer at the DIY repair site iFixit, suggests imagining a battery as a sponge. When you first pour water onto a dry sponge, it absorbs liquid quickly. For a battery, this is the fast-charging phase.

As you continue to pour water onto the increasingly wet sponge at the same rate, the liquid will bead up on the surface as it fights to soak into the saturated sponge. For a battery, this unabsorbed charge can result in shorts and other issues that could potentially damage the battery.

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