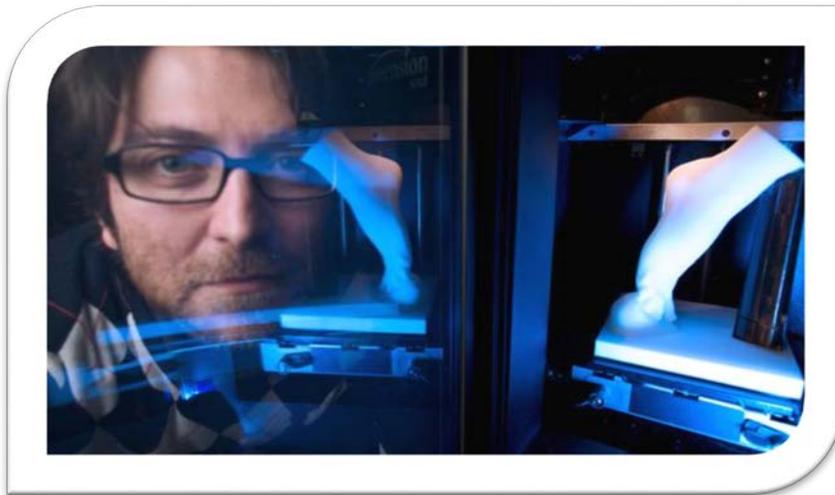


3D PRINTING OFFERS NEW DIMENSIONS FOR AT

The advances in 3D printing are leading to exciting developments in many fields, including assistive technology (AT). We have heard about design companies and individuals creating prosthetic ears and hands, portable wheelchair ramps, fork holders, and even visual representations of mathematical concepts. The possibilities are almost limitless!



3D printing is an emerging technology that reads a computer file of directions and then uses a special printer to add layers of material, such as plastic, to create a three-dimensional object. 3D printing was first used in the 1980's for

commercial manufacturing. Today, 3D printing has become available for home use. Now, anyone with access to a 3D printer can think of a product design, create a digital file, and print out a product with low cost materials.

In the AT world, 3D printing capability creates endless options for producing custom products that are often much less expensive and more quickly delivered than traditional AT products. Both “do-it-yourselfers” and the AT industry can benefit from this promising technology.

How 3D Printing Works

So how does this 3D printing really work?

First, a digital model of the object to be created is needed. Typically, digital models or files are created with computer aided design (CAD) software or a 3D scan of an existing object. 3D models can also be created by applying photogrammetry (i.e., the science of making measurements from photographs) software to a plain digital camera photo. Free and open source design tools are available on sites such as the following:

- 3dtin.com (www.3dtin.com)
- Tinkercad.com (www.tinkercad.com)
- Sketchup (www.sketchup.com)
- OpenSCAD (www.openscad.org)
- Blender (www.blender.org)

“Ready-made” instructions are available through open sharing forums online and for sale. A popular site, www.thingiverse.com, offers 3D designs ready to print. The site www.yeggi.com is a search engine for 3D designs that combs various marketplaces and repositories for specific models. The designs and instructions range in price, but many are free.

Second, a 3D printer is required. 3D printers have just recently come down in price and have become easier to use, making them more accessible to the average consumer. Companies such as Cubify, Staples, Makershed and Amazon are selling 3D printers for home use. The 3D printer adds layers of heated material such as plastic filament (like Legos), wire, or metal that builds up to produce a tangible, three-dimensional print out.

3D Printing and Aids for Daily Living

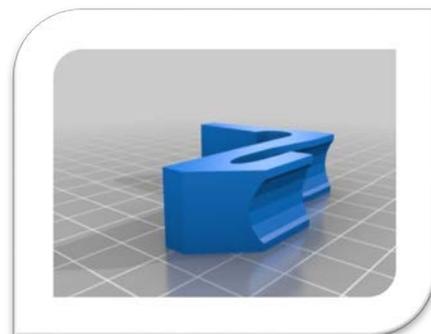


Adjustable bottle cap opener
Source: www.thingiverse.com

3D printing is useful for printing low-tech aids for daily living. Ollie B., a student at Hereward College in England, has muscular dystrophy and used 3D printing to solve an annoying problem. Ollie has limited strength and must use a straw for drinking, but the straw tends to slip around, making drinking difficult. With the help of his professor, The University of Warwick Computer Science Department, and Warwick Manufacturing Group, he created a straw holder that can be easily printed out on a 3D

printer. Other students took his idea further and created a 3D printed straw that fits into a wine glass as well as a personalized fork which makes eating easier for those with limited grasping ability and mobility.

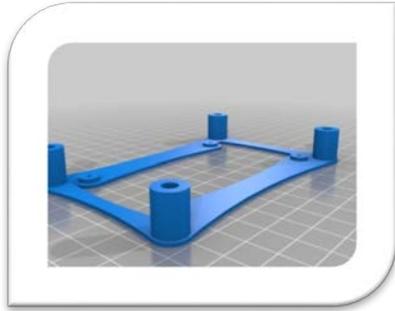
While many daily living aids are available for sale, the ability to customize the aid for a particular need can result in a more functional product. For example, wheelchair users can find mounting devices designed for tablets and phones that are customizable. For those with grasping difficulties, there are instructions for printing many variations



Pen cap opener
Source: www.thingiverse.com

of devices such as adjustable bottle cap openers, microwave door openers, and pen cap openers.

3D printing can also make replacement parts for assistive devices or small pieces that may not be available for individual sale. For instance, a person who uses a walker can print out a single hinge as a replacement part. Instructions for printing walker feet and replacement tips for canes are also available. The ability to create replacement parts can save the expense of replacing the entire device for one broken or worn out piece.

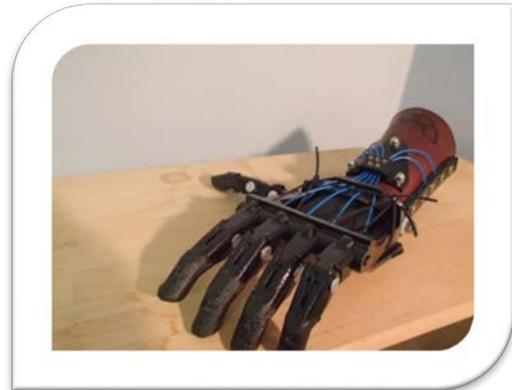


Tablet Mount for wheelchair
Source: www.thingiverse.com

The technology is becoming accessible to more people as 3D printers are becoming smaller and less expensive. As more people are creating and sharing digital product designs, the variety of available product instructions is increasing. These developments are promoting better access to important assistive devices that can ease daily tasks for people with disabilities and older adults.

3D Printing and Prosthetics

3D printing technology has already had a big impact on prosthetic limb development. Traditional prosthetic limbs are very expensive to make and most insurance companies do not cover the costs. For children who will outgrow their prosthetics several times, cost and access issues are an even bigger concern. With 3D printing, prosthetics can be customized and created more quickly and at reduced expense. There have been numerous news stories recently about people using 3D printers to print artificial hands, arms and legs.



Talon Hand
Source: www.enablinthefuture.org

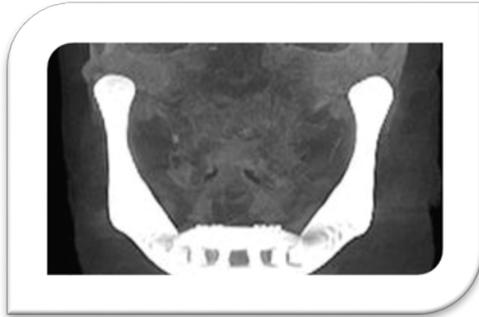
As the technology is catching on, community projects are being established to share the benefits. A network of volunteers formed a group called E-NABLING the Future that uses 3D printing to create prosthetics for those in need. The group offers ready-made designs on its website.

One of the most popular designs is the e-NABLE Talon Hand. It is designed for children, is made durably, and features an integrated tension system that allows the user to control the hand's fingers. To propel the technology forward, E-NABLING the Future stresses the importance of a community approach to 3D printing of prostheses. This

community approach encourages developers to share their ideas, collaborate, and make designs and instructions available at no cost.

The Helping Hand Project is a similar program that uses 3D printing to create affordable prosthetic hands for children with disabilities. The Open Hand Project is another similar program that makes prosthetic hands available for less than \$1,000.

Future of 3D Printing



*3D Printed jaw transplant
Source: CBS News*

While the concept of 3D printing already seems futuristic, the field is constantly evolving. It seems that 3D printing of actual body parts is not that far away. A woman has already received the first 3D printed jaw transplant.

Scientists have recently used human tissue to print liver tissue that could survive on its own. A biotech firm called Organovo, has begun printing liver tissue with the hopes of being able to eventually print a fully functioning liver.

In the near future, 3D printed tissue will be used in patient treatment to replace small parts or organs and encourage cell regeneration. So while 3D printing now allows anyone to print out a prosthetic leg, in the future they may be able to print out a new leg entirely!

For More Information

Please visit [www. AbleData.com](http://www.AbleData.com) for more information about organizations that have resources for 3D printing.

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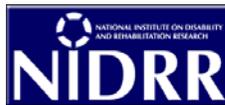
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