**Does the availability of bionics/prosthetics help the lives of people who use them in our society**

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# Introduction

Bionics is a branch of technology that integrates the study of biology and its natural patterns with mechatronics, which is a combination of mechanics, electronics, and software. Bionics is made up of many distinct sectors, but one of the most well-known and popular is bionic implants. These implants are intended to improve the quality of life for those who have injured body parts like as limbs, legs, eyes, or even ears, bionic prostheses are artificial limbs that move seamlessly using signals from human muscles, and artificial limbs are artificial limbs that require human strength. Hence, this is the main difference between bionics and prosthetics.

Today's bionic prostheses are not only lightweight and durable, but some are custom-made to perform specific tasks.

Bionics improve safety and mobility for prosthetic wearers with transfemoral amputations but have additional functional benefits for prosthetic wearers with upper limb amputations or congenital limb differences . Bionic solutions for the upper extremities include myoelectric prostheses. It relies on sensors in the socket to detect electrical signals from muscle activity in the stump and generate prosthetic components such as: B. To control the prosthesis. This allows the prosthetic hand to function in a more natural way without the need to compensate for strap or shoulder movements. Such systems can provide an improved level of control over traditional mechanical systems, and some systems can even recognize patterns of stump muscle activation to allow simultaneous movement of multiple upper limb joints. .

The usage of prosthetic limbs is critical for those who have lost a limb to preserve function and health. As a result, prosthesis care specialists advocate coordinated actions to keep the patient's stump and prosthesis in a gentle relationship.

Individuals with compromised residual health are at increased risk of suffering prosthetic fitting failures. People with healthy remnants are more likely to maximize comfort, stability, and mobility when using an appropriate prosthesis. Individuals tend to oscillate between low (e.g., bedridden, wheelchair use, and two non-prosthetic crutches), dissatisfied (e.g., two prosthetic crutches, cane, and painful independent walking), and adequate activity levels. Depending on their satisfaction with, Prosthetic fitting, functionality, need for aids. People often fall into the trap of going back and forth between unsatisfactory and satisfactory health with prostheses, depending on the level of pain. Pain leads to frequent and all too often permanent abandonment of the prosthesis. Overall, the repeated treatments associated with prosthetic fitting create a large personal burden and a heavy socioeconomic burden (e.g., medical costs and absenteeism from work).

The field of bionics is wide-ranging, but there are many possibilities in the field of implants. For example, instead of placing a bionic implant in the amputated person's arm, an electronic exoskeleton could be added to the body to improve endurance and increase resilience. In the future, we may see people walking with prosthetic limbs as a more powerful and efficient alternative.

A prosthetic leg is the simplest example, as it is 'only' a mechanical product. Far more complex devices with sophisticated electronics and signal processing were designed to restore vision and make direct contact with brain tissue. We can imagine that it would be possible to restore, control or enhance the physical functions of the individual, and even connect directly to medical services via a personal communication system.

# Discussion

Prosthetic and Bionic limbs, in recent decades, we've seen encouraging trends in the development of bionic limb solutions that may perhaps ease, one after the other or entirely, a number of the residual fitness and maturing issues. Some advancements provide improved prosthetic attachment via Osseo integrated implants, which may either increase the residual limb and facilitate socket fit (e.g., endoskeletal implant) or protrude the pores and skin to allow the use of bone-anchored prostheses (e.g., endoskeletal-exoskeletal implant) . Other enhancements, such as regenerative peripheral nerve interfaces, targeted muscle reinnervation (TMR), agonist-antagonist myoneural interface, and sensory feedback, aim primarily to reduce pain and increase control of prosthetic limbs.

Although with Osseo integrated implants it has its advantages and disadvantages. Bionic limbs are often attached using custom-fitted attachments to prevent them from slipping off. These attachments, however, are not particularly healthy since they do not burden the remaining bones of the severed leg and break readily. To avoid this, osseointegration (Osseo = bone) joins the bone to a titanium abutment that is directly attached to the bionic limb. This stresses the bones and surrounding region, making them healthier. The disadvantages of osseointegration are that the procedure takes time and that the region surrounding the abutment might become infected if not cleaned adequately.

Overall, individuals developing bionic bone-anchored prostheses may need to significantly reduce socket-related issues and improve intuitive use of synthetic limbs Early evidence of the medical outcomes of these innovative therapies suggests that they have the potential to produce life-changing improvements (e.g., frame image, sitting comfort, Osseo perception, aching reduction, prosthesis management, walking ability, and fitness-related first-class of life).

There is a need for more data information about rehabilitation and prosthetic care bionic solutions

Reports of medical advances of a selected answer have a tendency to attention normally at the layout of interface among the frame and the hardware (e.g., Osseo integrated implants and electrodes), screening process (e.g., eligibility criteria), surgical techniques (e.g., quantity of levels and reinnervation matrices), becoming and layout of prosthetic components (e.g., microprocessor-managed joints and manage algorithms) in addition to short- to long-time period consequences (e.g., bodily obligations and health-associated nice of life)

Although essential to a success medical consequences, rehabilitation procedures (e.g., schooling exercises) and prosthetic becoming recommendations (e.g., placing of components) for brand spanking new answers are regularly regions of non-stop improvement and, therefore, are under-reported . The degree of expertise and reputation of pre- and postoperative medical care might also additionally range among interventions for decrease or top bionic limbs.

According to the Amputee Coalition, of the more than 2 million people who lost a limb in the United States, the majority (54%) were due to conditions such as diabetes and peripheral artery disease, and 45% were due to trauma. According to a paper published in Prosthetics and Orthotics International, the global prevalence of traumatic amputations exceeded 57 million in 2017. Rising amputation rates and growing need for better technology to restore the quality of life of amputees are driving the growth of the market.

Rapid advances in technology, especially in robotics, are also major drivers for the growth of the robotic prostheses market. The use of better materials, biosensing, the use of artificial intelligence, and other tools are behind the rapidly evolving field of robotics. Bionic limbs make robotic limbs feel like normal limbs, allowing for more agile and human-like movements, making robotic limbs aesthetically pleasing. The only downside, however, is that these technologies are expensive and inaccessible to the general public. These advanced technologies are still in the development and testing stages and are ready to revolutionize the market. For example, Swedish researchers have studied and improved a new version of a consciously controlled prosthetic hand that can significantly improve the quality of life of amputees. The prosthesis is surgically attached to bones, muscles, and nerves, and implanted electrodes pick up signals from the brain to help with movement, touch, and more, just like a normal, natural arm. Such innovations have contributed significantly to the global growth of the robotic prosthesis market.

Government initiatives and support for increasing R&D activities in the field of AI and robotics are also propelling the market towards growth. The Défense Advanced Research Projects Agency (DARPA) is also involved in developing new prosthetic systems for veterans. An example of that development is the LUKE arm system developed in collaboration with DEKA Research and Development Corporation. It is a modular system and runs on batteries. An intuitive control system that allows multiple joints to move simultaneously enables dexterous arm movements. The COVID-19 pandemic has had a major impact on all industries due to rising raw material procurement costs, rising transportation costs, and other factors. In addition, cross-border shipping bans have also caused an industry slowdown. However, increasing R&D initiatives by the robotics or IT industries in the field of artificial intelligence are the major drivers of the market. World-class research in this area is driving unprecedented market growth. Improving the types of materials used to manufacture prostheses are also boosting the market growth. All of the above factors have contributed to the market rally.

The advantages of using Bionic Limbs are:

Restored sensation, improved prosthesis reintegration/embodiment, and greater controllability. Future applications of LL have the opportunity to achieve better balance and near-normal gait, with reduced falls and energy expenditure.

Despite some promising aspects that innovative bioengineering solutions offer, there are still some limitations that need to be addressed before similar devices are widely applied. Percutaneous cables were used in most clinical studies. Cable exit points on the skin are of concern from both a mechanical and infection control perspective. A fully embeddable solution should be developed and tested.

The presence of microelectrodes for in vivo recording and/or stimulation makes the whole approach vulnerable to stress-induced mechanical failure. However, for future clinical practice, the solution should be a fully implantable system that avoids daily connections and disconnections between leads and neurostimulators.

Bionic prosthetic replacements may be available as fully implantable bi-directional upper limb devices, controlled via electrodes implanted to receive muscle or nerve signals, with sensory feedback achieved by nerve stimulation. Promised. In the future, it would be interesting to implement such bionic solutions for lower limb amputees, especially those with severe femoral amputees. These solutions promise significant improvements in health and overall quality of life.

More data is wanted to clarify the relationships among surgical procedure, medical care, prosthetic becoming, and consequences of cutting-edge and rising interventions (e.g., efficacy and safety) which can be essential for organising an evidence-primarily based totally reasonable, and finally best, trendy of take care of cutting-edge and destiny bionic answers.

Raschke (2022) has provided an introductory summary that gives vital insights into the history of prosthetic technology and practice in the context of the sequence of industrial revolutions (Industry 1.0 to Industry 4.0). Raschke provided her insightful perspective on the anticipated benefits of the current industrial transformation. The evolving Industry 4.0 is defined by the fusion of physical, digital, and biological systems that support the development of intelligent technologies and innovative bionic bone fixation prostheses (advanced manufacturing, additive manufacturing, data analytics, simulation, horizontal/vertical integration, cybersecurity, cloud computing, industrial internet). Raschke also stressed the significance of doing health economics analyses to balance the costs and benefits of these improvements.

According to Raschke (2022), the effective development of bionic solutions that integrate physical, digital, and biological systems requires a series of modest stages. This study subject helps to the worldwide effort by identifying knowledge gaps and sparking conversation about these novel concepts that might enhance clinical and prosthetic care for bionic prosthesis.

These clinical and prosthetic care advances lead to the development of a worldwide ecosystem in which many organizations and services integrate the value chain of these bionic solutions via diverse commercial models. This new ecosystem comprises prosthetic solution suppliers as well as healthcare administrators. More significantly, consumers become vital to the ecosystem through their engagement in co-creation of innovation and the impact of consumer advocates. All stakeholders must be involved to guarantee that these bionic advancements really and safely enhance the lives of the expanding population of persons suffering from limb loss across the world.

Prostheses have been used for about 3000 years. It was designed to help individuals appear "normal" at the time, but it should still be as if not more beneficial now. People's lives alter as technology advances. People will have limbs that they can manipulate with their cell phones instead of latex arms that merely float around.

Advanced prosthetic technology blurs the gap between disability and ability, forcing a shift in public opinion. It would have been unimaginable at the time of the first Paralympic Games in 1960 that amputees should not compete with them if they have an unfair advantage. There is an Olympian who claims that A blind man can be rehabilitated by a camera, a paraplegic can walk again with a motorized exoskeleton, and a smartphone app can control his bionic hand. But sometimes really big changes are easy. It's so easy that you can tie your shoelaces yourself and walk away.

But as I am not a member of the limb-indifferent community or an official member of the bionics industry, listen to Patrick Kane and how technology transformed his life

*“I was born with the usual set of limbs. When I was nine months old, I contracted meningococcal septicaemia, a dangerous infection of the blood, which very nearly killed me. I survived, but because I had sustained major tissue damage, it became necessary to amputate my right leg below the knee, all of the fingers on my left hand and the second and third digits on my right hand. I learned to walk on a prosthetic leg at the age of 14 months and have gone through my life wearing a succession of artificial limbs.”*

*“As time has passed and technology has advanced, so too have my limbs. Like our mobile phones, prostheses have become lighter, faster, and more efficient.* *When I was nine, I was fitted with a lifeless silicone hand, a useless thing that was purely cosmetic, and so clumsy that I refused to wear it after the first day. Now, at 21, and a student in my third year at Edinburgh University, I wear a bionic arm with nimble fingers that move independently, which I operate using controlled muscle movements in my forearm, as well as an app on my phone. As a child I wore a stiff artificial leg attached with straps that frequently fell off; earlier this summer, I took delivery of a new dynamic right leg with shock absorption and carbon fibre blades. But the prosthetics, and the private clinic, were very expensive. They were only available to me due to another incredible stroke of good fortune.”*

*“My life was transformed by my new arm. Everything got easier. I used to open bottles of water by clamping them between my thighs and twisting with both hands, but now I simply hold the bottle in my firm bionic grip and twist with the other. I noticed that it also changed how others perceive me. No longer did I get looks of pity when walking in public. Instead, the looks I got changed to genuine curiosity at this robotic device. People would approach me to say, “I just have to know what this is and how it works.” I have discovered that people would much rather talk about these things – they just don’t know if it’s allowed. The non-realistic look of the hand is a message to others that I am happy to talk about it.”*

Patrick Kane is just one example of how great bionic prostheses can be. Technology has advanced so much, especially in bionics that we will never live without it again as It has made such a difference in so many people’s lives.

# Conclusion

I believe in the human ability to overcome anything given the chance. Bionic Limb embodies that hope. They have already helped restore skills lost through injury, disease, or genetic mutation, and this continues to increase with each passing year.

The benefits reap over the negatives to having a bionic limb although with the drastic increases in possibilism with these new bionic prostheses as does the prices which doesn’t make them as widely available as they can be.

Bionics has shown to benefit many victims throughout the world, as difficulties emerging from heart transplants, deafness, and immobility, to mention a few, have been remedied by the advancement of prostheses to bionics.

Furthermore, progression in technology and how it impacts humanity, as we gain knowledge about the world around us, humanity further evolves as new inventions and discoveries lead us to live a more convenient life from enabling global communications to transforming healthcare, technology has brought about big, large-scale changes.

In the end I believe that the availability of bionic prostheses today is becoming more available and inexpensive compared to years ago with the new technology discovered over the present and coming years, along with more useful features and components that make life easier for the people using them.

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