A Sociotechnical Analysis of Prosthesis Abandonment

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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The Importance of Limb Prostheses

The number of Americans with limb loss is projected to increase from 1.6 million persons in 2005 to 3.6 million by 2050 (Bates et al., 2020). Prostheses offers those with limb loss increased mobility autonomy through decreased reliance on support people and supplemental devices. Most often, limb prostheses are used for patients with major limb loss due to birth defects, amputation, or trauma with the purpose of acting as the missing limb. Advancements in the engineering field have led to durable devices which can be used for multi-functional purposes in everyday life with little reliance on other people and other mobility assistive devices (Bates et al., 2020; Cordella et al., 2016) However, users may abandon prosthesis based on personal or technical factors. [1] The personal factors are gender, race, age, and social status. The technical factors are technology performance, device fit, and limb location.

Patient identity may influence the acceptance or abandonment of a prosthetic device at any stage of the diagnosis and preparation, design and fitting, rehabilitation and training, and reintegration to everyday life.[2] In more detail, patients may experience hardships due to personal factors including race, gender, age, education, and socioeconomic status (Davie-Smith et al., 2017; Dougherty, 2017; Pasquina et al., 2015). From the technical perspective, patients may reject prosthetic devices due to uncomfortable materials, incompatibility with residual limb, unsatisfactory prosthesis performance, difficulty of use (Burrough & Brook, 1985). Acknowledging the factors which influence the acceptance or rejection of a prosthetic device

[1] This paper uses the notation actors, factors, or variables as the personal and technical influencers of prosthesis abandonment.

[2] This paper refers to prosthesis success as positive user interaction and high levels of usage in everyday life. Prosthesis abandonment or rejection refers to negative user interaction and low levels of usage or not used in everyday life.

improves the prosthetic field through innovation of new technologies. Additionally, becoming aware of the discrimination in the medical field encourages active social interactions of patients, doctors, and engineers to address disparities for device improvements and creates equity in the health care system.

The research will discuss factors that influence prosthesis abandonment. This paper utilizes Actor Network Theory (ANT) to identify and organize the contributors in the prostheses network and the Social Construction of Technology (SCOT) as an analytical tool to examine the abandonment and necessity of individualized medical care. Essentially, the research will discuss the answer to the following question: How do personal and technology factors affect the predictability of user satisfaction or abandonment of prosthesis based on four stages of diagnosis and preparation, device design and fitting, rehabilitation and therapy, and reintegration in society?

Methods and Organization of Research

The methodologies of network analysis and case studies are employed to answer the research question. The network analysis approach is used as an organizational tool to determine the factors from the identified using Actor Network Theory. This approach accounts for categorizing the contributors and responders in the prosthesis field. The factors considered in this study are environmental factors such as age, gender, and socioeconomics, and technical factors such as limb location, technology performance, and device fit. The case studies method will develop the STS analysis of the information in answering the research question. Thirty one research papers discussing prosthesis abandonment case studies were examined. Six were effective for answering the research question. Each case study will be used to analyze the necessity for an individualized device based on personal and technical factors involved with each case. The research is collected from databases by using keyword searches like “limb prosthesis,” “prosthesis abandonment,” and “limb prosthesis case studies.” The following background information will define three current prosthetic technology categories and the four stages. The results and discussion section is organized through a comprehensive examination of the four stages of prosthesis acquisition through identifying both environmental and technical actors, and then reviewing case studies to discuss prosthesis abandonment with SCOT framework and establish the importance of unique prosthesis for each user.

Defining Prosthesis Limb Location, Technology, and Stages of Acquisition

Prosthetics encompass the science, medical, and engineering field which pertain to devices applied to humans for cosmetic or mobility assistance. Recent advances in technology have improved comfort, performance, and functionality of prosthesis. Currently, the three most common types of prostheses are myoelectric, cosmetic, and body-powered (Biddiss & Chau, 2007). The typical prosthesis phases of acquisition are diagnosis and preparation, design and fitting, rehabilitation and training, and reintegration to everyday life. The following paragraphs will expand upon the differences between prosthesis limb location, types of prosthesis, and the four phases of prosthesis acquisition.

Limb prostheses technology are different in their body part application. The technology available to accommodate the intended functions, fit comfortability, and desired performance will be different. As a result, the general difference in prosthesis technology can be categorized for upper and lower limb. Upper limb prostheses require high level of refined motor skills in the fingers. Lower limb prostheses require stability and reliability (Raichle et al., 2008). The technology available differs between upper and lower limb based on desired performance.

Prosthesis is generally chosen based on function and level of performance during work reintegration. Three available types of prosthesis are cosmetic, body powered and myoelectric. Cosmetic prostheses are used for human aesthetic purposes. This could be artificial limbs in place of missing limbs. Body-powered prostheses are human motion powered. The device is formed based on the existing limb. The motion of the phantom limb and adjacent body parts move the prosthesis through physical dynamic motions. The benefits of body-powered prostheses are the "durability, training time, frequency of adjustment, maintenance, and feedback" (Carey et al., 2015). Myoelectric prostheses use external power sources and electrical components such as electromyography (EMG) sensors to measure the muscular and nervous system responses within the body to achieve motion in the prosthesis. The benefits of this design include reduced phantom-limb pain, more functionality in light-intensive work (Carey et al., 2015). Myoelectric prostheses tend to be much more complicated, expensive, and difficult to use compared to body-powered prostheses. However, with myoelectric prostheses, more refined motor movement can be achieved.

The four stages of prosthesis acquisition are diagnosis and preparation, design and fitting, rehabilitation and training, and reintegration to everyday life (O'Keeffe & Rout, 2019). Diagnosis generalizes the doctor and healthcare prognosis for attaining a prosthesis. The preparation is the shaping of the stump and maintenance care to ensure the best fit for the prosthesis. In design and fitting phase, the prosthesis is custom fit for the stump and the type of prosthesis is chosen based on location and functionality (i.e., body powered, myoelectric, etc.).

The rehabilitation and training phase is primarily completed in rehabilitation centers. In these facilities, healthcare workers train users how to use, clean, and maintain their device. The reintegration phase is the longest segment and will require the user to adapt to everyday life through implementing their prosthesis in all activities. Prosthesis is intended for independent mobility without support of supplemental people and devices. As adult prostheses typically last for five to seven years, the prosthesis acquisition repeats in a cyclic manner.

Using ANT and SCOT STS Frameworks to Analyze Prosthesis Abandonment

The two analytical STS frameworks utilized in the discussion of the research question are ANT and SCOT. Notable founders of ANT are Bruno Latour as well as STS scholars, Michael Callon and John Law. These founders introduced the analytical framework as a complex network or system which connects many actors or entities together. This network can be a multifaceted web of human and non-human actants with social and technical elements which comes together in a metaphorical backbox (Cresswell et al., 2010). For instance, ANT can be used to examine wildlife tourism and the sociotechnical interactions of wildlife ecosystem, tourist travel, and economics. Prosthetics has developed into a large field of medical and technological sciences which have complexity and seemingly infinite applicability. As mentioned previously, Actor Network Theory is an applicable analytical tool which is used to identify and organize the personal variables such as race, age, gender, and socioeconomic status and the technical variables such as limb location, function of technology, and device comfort, and the relationship to prosthesis abandonment during the four outlined stages of acquisition.

The other framework used is SCOT. This analytical tool was found by British sociologist, Trever Pinch, and Dutch philosopher, Wiebe Bijker. The four principal ideas of the framework are interpretive flexibility, relevant social groups, closure and stabilization, and wider context (Klein & Kleinman, 2002). In essence, advocates of SCOT claim that technology develops through an interactive process to support relevant social groups. For instance, the design of a kitchen can be analyzed using SCOT to exemplify the social forming of technology like placement of cabinets, a stove, and a sink for convenience and efficiency. Alternatively, critics of SCOT would claim that society develops as a result of technology. The SCOT ideology is applicable in suggesting the consistently changing medical field which is based on human needs. SCOT is being applied to analyze and understand the complex relationship of factors and their contributions to cause prosthesis as successfully used or rejected. Individuals and their unique mobility cases determine the context and applications of technology as well as the research and development of new technologies. There is limited STS literature on SCOT and limb prosthesis.

Both ANT and SCOT STS frameworks are similar in their reflexivity ideology of humans advancing and requiring technology in society. Advocates claim that there are many complexities between actors and there is a non-linear contingency in each context. Social constructivist critics argue in favor of technological determinism, or the technology shaping society. STS is always changing and developing just as the world changes. Therefore, many critics argue that both frameworks are too simple in understanding society and technology. Modern STS scholars may prefer a variance theory or 'theory as enlightenment' (Geels, 2007). Geels (2007) defines variance theory as our world composed of multiple variables rather than regularities, and the theory as enlightenment as less conventions and assumptions such that new perspectives can be formed. These less strict theories suggest prosthesis both develops for social groups without limbs, and those individuals shaping the field of prosthetics.

Conducting this research is necessary for the STS field because it improves the medical care system through understanding the stages of attaining limb prosthesis, factors and their relationships to prosthesis, and any influence in acceptance or abandonment of the device. Examining prosthetics and rejection reveals more about the healthcare system because there is no "essential distinction between prosthetic and other technologies, because all technologies in some way aim to replace or augment aspects of human functioning" (Brey, 2005). Acknowledging rejection rate factors and addressing influencers strengthens the medical care system. Limb prosthesis is a device adapted for a patient's individualized needs. The medical and scientific fields are consistently improving based on research and development. In larger scope, improving mobility using external assistive devices is a personal choice, but having a healthcare system through inclusivity without disparity factors to affect the outcome is necessary for justice.

Analyzing Factors Influencing Prosthesis Abandonment from Four Stages of Acquisition

Limb prostheses technology have been around since the nineteenth century to aid persons with limb loss requiring a mobility assistive device some restored functionality to their missing limb (Aman et al., 2019). However, prosthesis may be successfully used in everyday life or abandoned for numerous personal factors and technical factors. In more detail, the personal factors are age, gender, race, and socioeconomic status. The technical factors include technology function, device fit, limb location, and accessibility to support. These factors influence all phases of prosthesis acquisition and use. As previously mentioned, the four stages are diagnosis and fitting, prosthesis design and fitting, rehabilitation and therapy, and reintegration into society (O'Keeffe & Rout, 2019). At any of these stages, individuals face "risk factors and emotional/psychological factors" which influence the limb prosthesis acceptance or abandonment (Callaghan et al., 2008). Due to the various factors involved at a personal and technical level, prosthesis must be treated, designed, cared, and reintegrated on a personalized level for the most effective device use.

Stage 1: Diagnosis and Preparation

At the diagnosis stage, the primary personal actors influencing prostheses acquisition are race and socioeconomic status. Often, an uncontrollable factor associated with socioeconomic status are geographic location. Residential location correlates with hospital, facilities, and surgeon expertise. Certain hospital regions in lower income or developing areas lack access to medical technologies. These socioeconomic factors ultimately influence any medical recommendations. For instance, revascularization is a treatment method to regain muscle, organ, or nerve function through blood transportation following trauma to a limb. This treatment costs more money than prosthesis due to the time required and health provider treatments. Underserved populations and predominantly African American patients receive amputation diagnosis over revascularization four times more often from medical professionals (Holman et al., 2011; Pasquina et al., 2015). Any medical costs influence the mobility technologies available for prescription.

Due to systemic prejudice in the country, certain groups of individuals receive different health care than other groups. Racial and socioeconomic inequity in the medical field exist and contribute to the prosthesis acquisition. In certain cases, some individuals do not have the accessibility to attain prosthesis due to personal reasons including race and socioeconomics. In these cases, SCOT applies as the context of prostheses have become adapted for certain groups of people who are able to afford and acquire diagnosis without prejudice in the medical care system. Prosthetics must be human driven. The embedded acknowledgement of prosthetics must be changed. In doing just that, doctors must become more aware of any prejudice in the medical field and focus on the individual's unique case to prescribe prosthesis.

At the preparation stage, the doctors and medical staff prepare the residual limb for the prosthesis by performing surgery and caring for the stump so it is painless and functional (Jędrzejkiewicz, 2019). Some individuals do not have the opportunity or accessibility to have prostheses due to technical factors of existing limb location and condition. SCOT recognizes the limitations of prosthesis acquisition. However, the intention of introducing prosthetic technology is to provide inclusivity through mobility assistance for individuals with missing limbs. The accessibility is limited to individuals who have certain biological qualifications. Attention to detail must be taken care such that the patient and doctor are able to discuss all courses of possible action for restoring maximum mobility and function. Diagnosis options for individuals who have experienced limb trauma include revascularization, amputation for prosthesis, and prosthesis with supplemental mobility devices such as a wheelchair or cane. Doctors must consider each patient's case based on residual limb and intended performance.

Stage 2: Design and Fitting

At the design and fitting stage, age, gender, cost, comfort, and psychological well-being are key actors which affect an individual's acceptance or abandonment of limb prosthesis. Age affects the lifetime costs of prosthesis, which range between 345 to 600 thousand dollars, as replacement is required every two to five years (Davie-Smith et al., 2017; Dougherty, 2017; Pasquina et al., 2015). Due to the associated lifetime costs of receiving prosthesis, accessibility to affordable and reasonable healthcare with insurance impacts personal medical finances

(Schaffalitzky et al., 2009). In other words, a patient's socioeconomic status affects medical insurance coverage. Typically, more men than women receive prosthetic devices, and generally, men have better prosthesis fittings than women. Women and individuals who identify as LGBTQ+ are more prone to post-op comorbidity such as strokes, and women face longer rehabilitation periods (Pasquina et al., 2015; Walker, 2020). The underlying bias in the healthcare system systematically has benefitted men and individuals who are not LGBTQ+. Social action has the power to shape technology. Research of prosthetics is based on male statistics and male developed prosthesis design models. Consequentially, the medical care system has historically benefitted men. Society can determine the context of technology applications and innovation, and their direct impact through gender discrimination to assist certain relevant groups over other groups. Medical professionals must understand racial and gender bias in the healthcare system when choosing prosthesis technology to reduce prosthesis abandonment from an environmental variable perspective.

The technical actors influencing the prosthesis abandonment network include limb location, performance intention, and comfort. Prosthesis device fit and alignment should account for: "(1) socket shape and fitting methods, (2) alignment for stability and swing, [and] (3) selection of components" (Radcliffe, 1977). Prosthetics technology is responsible for device comfort, dynamic arm motions, and aesthetic. Any shift or changes from the expected function of the prosthesis could influence a user to abandon the device completely. Individuals who have undergone limb trauma receive amputation and are given a prosthesis for mobility. However, rejection rates are "estimated to be about 20% with upper limb devices and 15% with lower limb devices" (Schaffalitzky et al., 2009). Limb location dictates the technology available for each user. For the least chance of prostheses rejection, the types of technology available and limb location must be considered.

Society has control over the context of prosthesis technology and applications being successful. SCOT understands how prostheses affects related groups. To understand rejection rates, the type of technology must be analyzed. Body powered and myoelectric prostheses have varying uses and perform differently based on user application in everyday life. Table 1 exhibits rejection rates of different devices. The data indicates that age correlates with rejection rates as pediatric rejection is higher than adult rejection for both body-powered and myoelectric prostheses technology.

Device	Pediatric Rejection Rate	Adult Rejection Rate
Body-powered	45%	26%
Myoelectric	35%	23%
Incidence of Non-Wear	16%	20%

Table 1: Summarized pediatric and adult rejection rates of different prostheses device types from a case study and literature review conducted by Biddiss & Chau (2007).

Each part of the design and fitting must be customized for the user based on prosthesis intended performance. The following case study was conducted by researchers in Ireland about a middle-aged gentleman with pseudonym Phil. His lower limb prosthesis was a cosmetic prosthesis composed of nylon sockets and SACH feet, which allowed him to walk short distances. For his specific mobility limitation, certain prosthetic technology are not available (Schaffalitzky et al., 2009). Phil was not able to receive certain technology due to his specific limb location and expected device performance. This case study explored how certain variables in Phil's life evidently allowed some restored mobility.

A case study participant from the SORRI BAURU Specialized Rehabilitation Center received left arm and leg amputation the left arm and leg four years ago after limb trauma. The study found that custom 3D printed, body powered, upper limb prosthesis allowed the user to have more functional control over the limb, design aspects, intended performance, and aesthetics. Although the previous design model was not specified, it was ultimately abandoned by the user due to uncomfortable design, aesthetics, and difficulty of use (Figliolia et al., 2020). Figiliolia and her team examined the issue of prosthesis abandonment and suggested a more defined user-medical care relationship through actively engaging the user in the design process through using custom 3D printed parts. This engineering technique significantly increases use as the design can be developed to suit the user's performance needs.

Prosthesis abandonment within the design and fitting phase is highly volatile. SCOT applied to prosthetics determines that humans control the purpose of technology in society. The device must be chosen to specifically fulfill maximum performance and restore significant limb mobility. Custom 3D printing is a technique that would significantly reduce prosthesis abandonment through individualized device design and custom fitting process. Additionally, 3D printing customization would grant more interpretive flexibility to the prosthetics field and give more relevant social groups (lower income and pediatric individuals) ability for mobility restoration and usage. 3D printing would improve technology, device fit, and give accessibility to relevant social groups such as patients who do not have accessibility to expensive technology and time consuming constraints, or who have limitations receiving technology based on environmental factors. SCOT is defined by human interactions shaping technology. Humans control how technology is applied and whether it becomes successful or rejected in specific applications. The context of the technology starts with a change in doctor and patient interactions to ensure the best device outcome.

Stage 3: Rehabilitation and Training

At the rehabilitation and training stage, socioeconomic status and psychological well-being influence an individual's prosthesis outcome. Rehabilitation is an important step that correlates to positive prosthesis acceptance through increased residual limb care, range of motion in joints, muscular control, and prostheses fit (Aman et al., 2019). Individuals may choose home care, skilled nursing facilities, or inpatient rehabilitation facilities for rehabilitation options. Accessibility to quality rehabilitation and therapy care depend on socioeconomics and cost. Hospitals existing in higher-income, metropolitan areas traditionally are staffed well and use advanced medical equipment within teaching hospitals and trauma centers (Holman et al., 2011; Pasquina et al., 2015). These factors lead to social inequality and injustice in the medical field. The patient's well-being affects the outcome of the prosthesis because patient care type, frequency of care, active patient participation, and phantom limb pain occur during this third stage (Callaghan et al., 2008). The combinations of human variables shape the context of prosthesis acquisition and success of technology. People who have had limb trauma and received amputation must adjust to not only the trauma, but also face new identity and self-image issues (Aman et al., 2019). Prosthesis users must adapt to learning how to wear, maintain, and apply the device. Prostheses usage can be examined using SCOT. SCOT perceives prosthesis success is attributed to the social understandings and embedded medical care treatments as well as environmental variables. Through education of the public and supporting patients, the social understanding and abandonment of prostheses changes.

In a case study conducted by researchers in Ireland, a woman with pseudonym Jennifer received a myoelectric upper limb prosthesis following amputation. She also received Targeted Muscle Reinnervation (TMR) surgery after amputation to improve muscle function in preparation for the myoelectric prosthesis device. Jennifer rated the prosthesis as highly functioning but difficult to operate. Inevitably, her usage is low at four hours a day for four days per week (Schaffalitzky et al., 2009). The abandonment of Jennifer's device indicates that the training during rehabilitation and training phase is needed for more optimal use of the device. However, myoelectric devices have higher costs for "fitting, training, and maintenance" (Carey et al., 2015). Not all users can afford these associated financial and time costs. Through analyzing this case study with SCOT, the interaction of device function and limb location technical actors influence prosthesis abandonment in this case. The context of prosthetics is changeable through social awareness to understand device function. It is important for medical professionals to actively assist users during fitting and teach users during training and maintenance for the optimal prosthesis use.

One study conducted at the University of Texas compared prosthesis users who have been trained about the device and users who have not had training. The results suggested the trained group had improvement regarding efficiency of task completion and skill (Lake, 1997). Training is essential step and must support the user in correctly operating the device as well as maintaining the device for optimal prosthesis use. Social constructivists understand that social interactions change technology. Changes in requiring rehabilitation and training for users will change the technology. Instilling changes in the acquisition of prostheses changes the context of prosthesis for different individuals. For instance, medical professionals must instruct how to clean myoelectric device of sweat interference with electrodes and identify normal wear and tear in body powered device cables. If these measures are not taken, users may experience biological incompatibilities with materials, resulting in rashes (Aman et al., 2019; Schweitzer et al., 2018). Prostheses are meant to assist users and restore mobility function and unintentionally cause users some discomfort. The design aspect of the technology is pushed through social progression. Prosthetics is driven by these sorts of scientific discoveries. Addressing discomforts on an individualized level through patient-to-doctor discussions will improve the device comfort and fit, just as the science itself improves based on social demand.

The device socket shape, liner material, and fitting preparation affect the comfort, which ultimately determines whether a patient uses the device (Holman et al., 2011; Pasquina et al., 2015). Comfort, fit, and function in the design are primary reasons users abandon prosthesis. Lack of device care and maintenance result in low prosthesis use or complete rejection. Training and rehabilitation on an individualized level are necessary steps for patients to successfully use their prosthesis. The users must guide the technology and decide how to apply to aid individuals. Social constructivists recognize these changes influencing the interpretive flexibility for how prostheses are used in life, and how certain relevant groups who have undergone training determine their devices more successful than other relevant groups who have not received training.

Personalized care in rehabilitation and training recognizes patient's biological, mental, social, spiritual, and cultural conditions (Jędrzejkiewicz, 2019). Medical professionals, family, friends, and patients must be attentive in the individualized rehabilitation and training for the best prosthesis outcome. Social constructivists acknowledge the sensitive nature of prosthesis use based on these patient factors and technical factors. The combination and interaction of actors forms the idea of prostheses and influences the success and rejection of devices. Access to rehabilitation and training improves prosthesis acceptance rate. Implementing and improving the rehabilitation and training stage for all prosthesis patients will change the technology and rejection rates as this technology in society is an interactive process.

Stage 4: Reintegration into Everyday Life

At the reintegration stage, the personal and environmental actors which influence prostheses abandonment are gender, education, support, and physical well-being. Prosthesis makes some tasks more arduous but grants mobility function to users. These daily activities include hygiene, eating, grooming, and dressing (Biddiss & Chau, 2007). In essence, prosthesis can be used for a variety of tasks and the goal is to make these activities easier with the device than without.

In addition to daily challenges, some users return to work after acquiring prosthesis. Patients who use their prosthesis regularly experience more success at work, better quality of life, and decreased phantom limb pain. However, individuals who do return to work might experience a shift in career prior to prosthesis acquisition. Discrepancy in technology success is attributed to environmental factors. Gender is an actor at the reintegration stage as fewer women than men return to work (Pasquina et al., 2015). How much an individual works then influences the income, residential location, access to hospitals, and costs of prospective prostheses. Individuals in low-income or near poverty are “2.5 to 3 times as likely as their peers who are not in poverty to perceive barriers in their access to work or community life" (Pasquina et al., 2015). The usage of prosthesis is impacted by gender, familial support, employer support, accessibility, and education. Sociotechnical influences at any part of reintegration contribute to device usage. It is how the environmental factors interact that impacts the abandonment of prosthesis for a patient. Encouraging strong support systems and global understanding leads to greater succession rates. Additionally, stabilization of prosthetics rejection rates by variables will change the interpretive flexibility such as prosthetics in the workplace.

A psychological change includes newly developed depression and anxiety associated with the prosthesis (Pasquina et al., 2015). Prosthesis changes a person's identity and well-being. While daily users embodied their devices and used phrases from an interview questionnaire like, "prosthesis is a part of me," and "I can't function without it" mentality, non-daily users considered that "the prosthesis never became a part of me," and they " never felt comfortable with it" (Widehammar et al., 2018). These alternative perspectives suggest positive prosthesis with identity have a strong correlation with device usage. Again, the context of prosthesis is correlated with interpretive flexibility. The divided understanding of the prosthetics in a wider context separates prosthesis users from prosthesis non-users. The environmental actors influence the rejection rates. Ultimately, tasks are varied in difficulty for different users. Patients and medical staff must work together to identify user performance goals and implement goals to the device decision.

The technical actors influencing prostheses abandonment are functionality, comfort, and aesthetic. There is a tradeoff between functionality of prosthesis and cosmetic aesthetic. Typically, functionality and performance are more important for users. The technological limitations from the size, bulky weight, and noise of the device limit user functions (Ritchie et al., 2011; Widehammar et al., 2018). The aesthetics of the device relate to the user's psychological well-being and thus impact usage. Limitations in prosthesis design cause unintended consequence to psychological well-being. Technology is continuously being developed and must continue to develop for various user functions, complications, and advancement. As such, prostheses have progressed out of social necessity for mobility assistance. Society pushes the role of prosthetics and applications of devices. Medical professionals in society determine applications of devices for relevant groups. It is important for society to continue the demand for prosthesis on an individualized case basis to improve the prosthetics field and improve the user-device interaction.

A case study involving 34 participants was conducted to measure prosthesis usage and wear time, activities, and satisfaction level. The mixed results suggest the prosthesis have different usage times, usage activities, and satisfaction rates. In summary, the most common number of hours a day prosthesis is used was none. The most common activity performed was with using tools. The most common satisfaction rating was tied between 3/5 - somewhat satisfied and 1/5 - very unhappy. (Burrough & Brook, 1985). Although the study is not current, the results imply that the functionality of these devices do not meet the user satisfaction. Functionality is the primary decision factor of prosthesis acquisition. The social necessity for mobility assistive devices has created discrepancy in satisfaction rates based on technical function expectations and design comfort. The combination of personal and technical actors influence prosthesis use. To stabilize interpretation and differences in variable to rejection rates, doctors and patients must transparently discuss function expectations and any concerns to have the best outcome.

The prosthesis abandonment is strongly related to several personal and technical variables. It is the combination of both personal and technical factors that contribute to the overall success of a user’s prosthesis. At each stage, doctors must work with patients to ensure the prosthesis functions, aesthetic, and design satisfy and support the user’s performance goals. This way, the interpretive flexibility of the technology is reduced. All stages of prosthesis acquisition must be individualized for the most used, positive outcome because socially, the world determines the technology and applications for technologies. These diagnosis and discussions should take the form of a unique prognosis and teaching instruction like a cancer treatment. This is because close diagnosis and patient checks at each level correspond to a higher usage rate. Patients must be involved, aware, and actively taught at every step of prosthesis acquisition. Patients and doctors must address the wider context and progress the medical and technological field of prosthetics together.

Limitations and Future Work

Limitations of this study are controlled by the summarized version of the numerous technical types of technology available. The current devices accessible to users are very expansive and the prosthesis applications are numerous. Another limitation is the lack of case studies exploring the environmental variables such as gender, race, and age on the overall influence on prostheses abandonment. One possibility of case studies availability could deviate from patient confidentiality, availability, and volition. Further research of prosthesis would examine prostheses and the cultural outlook, limb prostheses in sports, and limb prostheses and the relation between identity and/or well-being.

Future Considerations of Prosthetics

Limb prosthetics is a highly advanced field of medical engineering which has been developed for mobility assistance. Current device success rates are highly sensitive and heavily affected by environmental variables such as race, gender, age, and socio-economics and technical variables such as comfortable materials, limb location, and performance of the technology. Limb prosthesis should be personalized to suit patient needs and limit disparity in the medical field based on the identity and technical factors as it is the combination of these factors which contribute to the individual's prosthesis usage. Care, treatment, and device design should be uniquely individualized based on the factors, similar to a cancer treatment. The same approach and attention to detail must be taken for the best chance at prosthesis positively implemented for use in everyday life with optimal performance in mobility restoration and little effects to well-being. The medical field is continuously evolving and must adapt for the unique situations to support individuals.

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