

Chapter 30

Devices for Rehabilitation

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ABSTRACT

Rehabilitation is an area of focus by experts and researchers from different disciplines owing to the increase in number of various types of disabilities. This chapter covers information relating to causes and need for rehabilitation devices for differently abled people with motor, vision, or hearing impairment. The chapter begins with a brief on the disability population worldwide and in India, and progresses towards presenting available devices in global market and possible improvement that can be made to improve the functionality of the device and in turn improve the quality of life (QoL) of the users. Towards the end of the chapter, a reader can acquire the fundamental knowledge about the different types of disability, suitable aids, and working.

REHABILITATION ENGINEERING

Disability Data

Many people in the world live with some form of disability. It may either be a temporary or permanent impairment leading to difficulties in quality of living. According to the World Health Organization (WHO), the estimated figure of people with disability increased from 10% as reported from 1970s to 15% of the world's population as reviewed in 2011 factsheet of disability and health (Table 1). As estimated by World Health Survey and Global Burden of Disease that 110-190 million people globally suffer from serious form of disabilities with significant difficulties in functioning (Table 2). The growth in the number of people with disabilities is due to varied reasons such as increase in the number of ageing population, chronic diseases, health conditions, environment and other factors.

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Devices for Rehabilitation

According to the Census of India 2011, “Data on Disability”, information on eight types of disability namely sight, hearing, speech, motor, mental retardation, mental illness, any other and multiple disability was collected (Table 3). The report showed that the percentages of disabled population were more in rural areas as compared to urban areas and more in males in comparison to females. Also, the percentages of disabled population in each division showed a significant increase in 2011 figures as compared to 2001 records (Table 1).

Table 1. Percentage of disabled population to total population, India

Residence		Persons (In Millions)	Males (In Millions)	Females (In Millions)
Total	2011	2.21	2.41	2.01
	2001	2.13	2.37	1.87
Rural	2011	2.24	2.43	2.03
	2001	2.21	2.47	1.93
Urban	2011	2.17	2.34	1.98
	2001	1.93	2.12	1.71

Rehabilitation Engineering and Its Goal

Any form of disability cannot be fully restored but measures and efforts can be put in to improve the conditions. Rehabilitation engineering and assistive device/technology are terms which are often used interchangeably. However, there is difference between the two. In 1982, James Reswick, a pioneer in the field of rehabilitation engineering defined it as “the application of science and technology to ameliorate the handicaps of individuals with disabilities” while, assistive technology is product of rehabilitation engineering (Bronzino, 2014). For a better understanding, let us take an example of a person with one side of the leg amputee below the knee is using a prosthetic leg to aid him in locomotion. The process involved from designing to developing the prosthetic leg is known as rehabilitation engineering and the product obtained i.e., the prosthetic leg is known as an assistive device.

The area of rehabilitation is quite vast and extensive (John, 2006). It can range from correction in any deformity to replacing a whole part of the body with an aim to improve the quality of life of an individual from the current deprived condition. Major practices of rehabilitation and the assistive devices involved will be discussed in the following sections of this chapter.

When a person has some or the other forms of disability, one or more of the following functions are deprived:

1. A person may not be able to perform activities of daily living (ADL) independently and all such activities require support and assistance of another individual or caretaker. This may not only be embarrassing but at times bring about depression or disturb the mental balance of the patient.
2. Some form of disability may compensate a person with his ability to move around. They may require a minimal assistance of a walking stick or a walker for mobility or using a wheelchair in severe cases.

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