Module 08- Sensory Disabilities

Course Outline

- Learning Objectives / Outcomes
- Introduction
- Types of sensory disabilities
- The technology used for people with low vision
- The technology used for people who are blind
- The technology used for people with hearing loss
- Learning activities/ Instructional strategies
- Assessment Methods
- Resources and additional materials

Learning Objectives / Outcomes

- Define and understand the prevalence of sensory disabilities and causes related.
- Description of each type of sensory impairment
- Introduction to devices that increase participation, achievement, or independence for sensory-impaired people.
- Introduction to assistive technology used with sensory-impaired people

Introduction:

Sensory disabilities encompass a wide range of conditions that affect one or more of the five primary senses: sight, hearing, smell, touch, and taste. These disabilities can profoundly impact an individual's ability to access, process, and respond to information, which can lead to challenges in communication, learning, and navigating the environment.

This module will provide an in-depth exploration of sensory disabilities, emphasizing the importance of understanding these impairments within biological, psychological, and social contexts.

The following key areas will be addressed:

Prevalence and Demographics: We will review statistical data to understand the scope and scale of sensory disabilities across different populations and regions. The discussion will include age-related prevalence, as sensory disabilities can be present from birth (congenital) or acquired later in life due to injury, illness, or aging.

Etiology and Causes: A comprehensive examination of the causes of sensory disabilities is crucial for understanding the complexity and diversity of these conditions. This includes genetic factors, environmental exposures, traumatic injuries, systemic diseases, and the impacts of aging. For example, Usher syndrome is a genetic condition that affects both hearing and vision, while age-related macular degeneration predominantly affects vision in older adults.

Definitions and Classifications: Definitions of sensory disabilities have evolved, and this module will discuss traditional frameworks as well as current perspectives that reflect a better understanding of the spectrum and intersectionality of sensory impairments. We will reference the latest criteria from the World Health Organization (WHO) and the International Classification of Diseases (ICD) for standard definitions and categorization.

Impact on Individuals: The experience of living with a sensory disability is unique to each individual. We will explore how sensory disabilities can affect daily life,

social interactions, education, and employment. Personal narratives and case studies will provide insight into these experiences.

Adaptation and Coping Mechanisms: Individuals with sensory disabilities often develop innovative strategies to adapt to their environments. We will discuss coping mechanisms, resilience factors, and the role of community and family support in enhancing quality of life.

Legal and Policy Frameworks: Recognizing the rights of individuals with sensory disabilities is paramount. We will examine legislation such as the Americans with Disabilities Act (ADA), the United Nations Convention on the Rights of Persons with Disabilities (CRPD (Convention for the Rights of Persons with Disabilities)), and other international mandates that protect the rights and promote the inclusion of people with sensory impairments.

Cultural and Social Considerations: Culture and society influence the perception and management of disabilities. We will delve into how different societies view sensory disabilities and the implications for social inclusion, accessibility, and education.

Multidisciplinary Approaches: Addressing the needs of individuals with sensory disabilities requires a collaborative approach involving educators, healthcare providers, technology experts, policymakers, and advocates. We will discuss the importance of interdisciplinary collaboration in developing effective support systems.

Assistive technology: addressing each type of disability and the recommended assistive technology.

This module will equip learners with a comprehensive understanding of sensory disabilities, enabling them to approach the subject with empathy, expertise, and an appreciation for the complex interplay between individuals and their environments. Through a combination of theoretical knowledge and practical insights, participants will be prepared to engage with and support the sensory-disabled community effectively.

Types of sensory disabilities

The classification of sensory disabilities provides a framework for understanding the various challenges that individuals may face in their interactions with the world. Broadly speaking, these disabilities can be categorized into three primary types, each with unique characteristics and degrees of impairment.

1- Blindness and Low Vision

1.1- Low Vision

Low vision is a term that refers to a significant visual impairment that cannot be fully corrected with standard eyeglasses, contact lenses, medication, or surgery. Individuals with low vision may find difficulty in performing everyday tasks, such as reading, shopping, cooking, and recognizing faces. Low vision encompasses a range of degrees of visual impairment, including:

- Mild Visual Loss: Where individuals have difficulty with visual tasks that require fine detail.
- Moderate Visual Loss: Where the vision impairment impacts the individual's ability to see text or objects at a distance, which often necessitates the use of visual aids or adaptive techniques.
- Severe Visual Impairment: Where vision is highly compromised, and the individual may require substantial adaptation for daily living, including the use of assistive technology.

Causes of low vision are varied and pigmentosa and initial conditions such as albinism, hereditary conditions like retinitis pigmentosa, and acquired conditions such as diabetic retinopathy or age-related macular degeneration.

1.2- Blindness

Blindness represents a spectrum, from the inability to see any light to a legal definition where an individual's best-corrected visual acuity is 20/200 or less in the better-seeing eye. Blindness can be congenital or acquired. Congenital blindness may arise from genetic mutations, in-utero infections, or developmental anomalies. Acquired blindness may result from traumatic injury, progressive eye diseases, or systemic illnesses.

2- Hearing Impairments

2.1 Hearing Loss

Hearing impairments can range from mild to profound and may affect one or both ears. The primary categories include:

Conductive Hearing Loss: Occurs when there is an obstruction or damage to the outer or middle ear that prevents sound from being conducted to the inner ear.

Sensorineural Hearing Loss: Results from damage to the inner ear (cochlea) or the nerve pathways from the inner ear to the brain.

Mixed Hearing Loss: A combination of conductive and sensorineural hearing loss.

In children, hearing impairments can interfere with the development of speech and language skills, while in adults, it can affect social interaction and employment opportunities.

2.2 Deafness

Deafness typically refers to a severe hearing impairment where an individual has extremely limited or no hearing. People who are deaf may rely on visual communication methods such as sign language, lip-reading, or written text.

3- Dual Sensory Impairment

3.1- Deaf blindness

Dual sensory impairment, or deaf blindness, involves a combination of both hearing and visual impairments. The degree of each impairment can vary widely among individuals. Some people may have mild hearing loss and severe visual impairments or vice versa. Others may have total loss of both senses. This condition presents unique challenges, as compensating for one sense is often done through the use of another, which is not possible for those with dual impairments. Causes can be genetic, such as Usher Syndrome, or acquired through illness, trauma, or age-related degeneration.

Expanding Categories

Beyond these primary categories, it is important to recognize less discussed sensory impairments that affect the other senses, such as:

- Anosmia: The loss of the sense of smell.
- Ageusia: A condition that significantly diminishes an individual's sense of taste.

- Haptic deficits: Impairments in the sense of touch, which can profoundly affect motor skills and perception.

Furthermore, it is worth noting that sensory disabilities may not be static and can change over time due to the progression of the condition, medical intervention, or adaptation of the individual. The impact of sensory disabilities also extends beyond the loss of a specific sense, influencing psychological well-being, social interactions, and overall quality of life.

Understanding the types and nuances of sensory disabilities is crucial for professionals in special education, rehabilitation, healthcare, and social services. It allows them to provide better support, design appropriate interventions, and advocate for necessary accommodations and policies.

The technology used for people with low vision:

Screen Readers and Screen Magnifiers

- **Screen Readers:** are software programs that use auditory feedback to read the text displayed on a computer screen. They are essential for people who have very limited vision or are blind. These programs provide voice output for texts on emails, documents, and web pages, making digital content accessible.

- **Screen Magnifiers**: work alongside or integrated within operating systems to enlarge text, images, and other screen content. This software is particularly beneficial for users with some degree of vision who need to increase the size of text and graphics to read or see details more clearly.

Magnifying Tools

- Handheld Magnifying Glasses are perhaps the simplest form of visual aid, but technology has enhanced these basic tools with built-in lights and increased magnification power.

- Portable Magnifiers are electronic devices that not only magnify text on a portable screen but often come with additional features like contrast adjustments and the ability to save images.

Dictation Software

- Dictation Software allows individuals to operate computers and compose documents through voice commands, significantly reducing the need for typing and reading from a screen. This is particularly useful for creating emails, navigating the web, or drafting documents without straining the eyes.

Optical Character Recognition (OCR) Systems

- OCR Systems convert different types of documents, such as scanned paper documents, PDFs, or images captured by a digital camera, into editable and searchable data. For people with low vision, OCR technology paired with a screen reader can be immensely helpful in reading printed materials.

Video Amplifiers and Closed-Circuit Televisions (CCTVs)

- Video Amplifiers are devices that can be attached to monitors or use built-in screens to enlarge printed material, photographs, or anything that can be placed under their camera.
- Closed-circuit televisions (CCTVs) use a video camera to project a magnified image onto a screen, which is very useful for reading physical books, newspapers, or even doing handicrafts.

Talking Digital Book Players

- Talking Digital Book Players are specialized playback devices designed to play audiobooks, often from services like the National Library Service for the Blind and Print Disabled (NLS) or Audible. These players often have large, tactile buttons and speech feedback to make them user-friendly for individuals with low vision.

Independent Living Products

- A wide range of Home and Personal Living Products have been developed, including talking thermostats, large-button phones, and voice-activated home assistants that can control lighting, temperature, and other home appliances, enhancing independence for individuals with low vision.

Computer Accessibility

- Accessing the Computer: Operating systems like Microsoft Windows, macOS, and Linux distributions have built-in accessibility features, such as high-contrast modes, text-to-speech, and magnification utilities. These allow individuals with low vision to use computers more comfortably.

Mobile Device Accessibility

- Mobile Phones and Tablets: Smartphones and tablets come equipped with a variety of built-in accessibility features such as voice-over (a screen reader), zoom, and magnifier settings. These devices also support a multitude of apps designed to assist with low vision, including magnification and reading apps.

- Technology Embedded in Mobile Phones: In addition to the built-in features, mobile phones can also serve as controllers for a variety of smart devices and can run apps that recognize currency, read barcodes, and navigate using GPS – all with voice output.

By leveraging these technological advancements, people with low vision can experience enhanced levels of independence and engagement in both their personal and professional lives. As technology continues to advance, it is likely that even more innovative solutions will emerge, further aiding individuals with low vision in navigating their environments and accessing information.

The technology used for people who are blind:

Screen Readers

Screen Readers are vital for blind users as they provide an auditory interface to interact with computers, websites, and applications. They translate on-screen information into speech or braille and are sophisticated enough to allow navigation through complex web pages and applications.

Braille Technology

- Braille Printers (Embossers) convert text documents into braille format, allowing for tangible reading for blind users.

- Braille Translators are software that converts text to braille, which can then be printed using a braille printer or read on a refreshable braille display.

- Electronic Calendars designed for the blind often use audio interfaces to allow users to organize and access their schedules.

- Refreshable Braille Displays connect to computers or mobile devices and dynamically convert the text on-screen to braille using rows of pins that rise and fall to represent braille characters.

Voice-Controlled Devices and Software

- Dictation Software enables blind individuals to control their computers and compose text through spoken commands, eliminating the need for a mouse or keyboard.

- Optical Character Recognition (OCR) Systems can scan printed text and convert it into speech or braille, making printed documents accessible.

Audio-Based Devices

- Talking Digital Book Players are devices specifically designed to play audiobooks and have simple, tactile controls for ease of use by blind individuals.
- Talking Watches and Clocks, as well as other household items, provide audible information about time and settings.

Home and Personal Living Products

- Independent Home and Personal Living Products include a variety of devices, from talking kitchen appliances to accessible thermostats and smart home systems that can be controlled via voice commands.

Computer Accessibility

- Accessing the Computer: Blind users rely on screen readers, braille displays, and keyboard shortcuts to interact with their computers, with operating systems offering built-in accessibility features tailored to their needs.

Mobile Device Accessibility

- Mobile Phones and Tablets: These devices have screen readers such as Voiceover for iOS and TalkBack for Android, and many other accessibility features that make the devices usable for people who are blind.
- Technology Embedded in Mobile Phones: These include apps capable of identifying objects, reading text aloud, recognizing currency, navigating, and more.

Environmental Adaptations

- Audible and Tactile Signs and Warning Surfaces in public spaces inform blind individuals of their surroundings through audio signals or tactile feedback underfoot
- White Canes provide information about the environment through tactile input from the ground and are essential for safe navigation.

These technological aids are not only instrumental in allowing individuals who are blind to perform daily tasks and access information but also play a crucial role in enhancing their independence and quality of life. As technology continues to advance, it is likely that even more innovative solutions will emerge, offering greater assistance and more seamless integration into everyday life.

The technology used for people with hearing loss:

Assistive Listening Devices (ALDs)

- **Hearing Loop (Induction Loop) Systems**: These systems work by creating a wireless signal that is picked up by the hearing aid when it is set to the 'T' (Telecoil) setting. They are particularly beneficial in public facilities like theatres, banks, and churches, providing a direct wireless signal that can be adjusted for the listener's convenience.

- **FM Systems**: These are wireless systems that transmit sound directly to an individual's hearing aids or earphones via radio waves. They are useful in classrooms and group meetings where the speaker wears a small microphone linked to a transmitter and the listener wears the receiver.
- **Infrared Systems**: Similar to FM systems but using infrared light to transmit sound. They offer privacy because the signal cannot pass through walls. This system is often used in courtrooms and sometimes in home TV setups.

Augmentative and Alternative Communication (AAC) Devices

- **AAC Devices**: Ranging from low-tech to high-tech options, these tools support those who cannot use natural speech to communicate. The simplest forms include boards with pictures or symbols, while more complex systems use speech-generating devices (SGDs) or text-to-speech software on computers or tablets.
- **Text Telephone (TTY) or Telecommunications Device for the Deaf (TDD (Telecommunication Devices for the Deaf)):** These devices allow individuals with hearing loss to type messages back and forth to one another instead of talking and listening. They have been largely supplemented by modern text messaging and video relay services but are still in use.
- **Captioned Telephones**: These phones work like TTY/TDD devices but also provide a screen that displays captions of what the other party on the line is saying in real time.

Alerting Devices

- **Visual Alerting Devices**: These devices provide visual cues for various alerts, such as doorbells, smoke detectors, or baby cries by flashing lights or providing a visual indication on a device screen.

- **Vibrating Alerting Devices**: For more personal and portable alerts, such as alarm clocks or mobile phones, these devices shake or vibrate to signal the user.
- **Auditory Alerting Devices**: They may amplify sounds or change the frequency of sounds to make them more noticeable for individuals with residual hearing.

The integration of these technologies into the lives of people with hearing loss is essential for ensuring accessibility and independence. Smart technology and the Internet of Things (IoT) have further expanded the potential of such devices, allowing for seamless connectivity and customization to fit individual needs. As technology progresses, it continues to open new avenues for accessibility and enhances the quality of life for those with hearing impairments.

Learning activities/ Instructional strategies

- Multi-sensory learning Experiences by engaging different senses in the learning process can provide students with a deeper understanding of what it is like to live with sensory disabilities.
- Implement reflection and goal-setting exercises
- Analyse and differentiated instruction strategy on a regular basis

Assessment Methods

- Pre & post
- Online polling
- Dynamic questions

Resources and additional materials

1- Bourne, R.R.A., Steinmetz, J.D., Flaxman, S., Briant, P.S., Taylor, H.R., Resnikoff, S., Casson, R.J., et al. (2021), "Trends in prevalence of blindness and distance and near vision impairment over 30 years: An analysis for the Global Burden of Disease Study", The Lancet Global Health, Elsevier Ltd, Vol. 9 No. 2, pp. e130–e143.

2- Bruce, S.M., Luckner, J.L. and Ferrell, K.A. (2017), "Assessment of Students with Sensory Disabilities: Evidence-Based Practices", available at: https://doi.org/10.1177/1534508417708311.

3- Chapple, M., Davis, P., Billington, J., Myrick, J.A., Ruddock, C. and Corcoran, R. (2021), "Overcoming the Double Empathy Problem Within Pairs of Autistic and Non-autistic Adults Through the Contemplation of Serious Literature", Frontiers in Psychology, Frontiers Media SA, Vol. 12, available at: https://doi.org/10.3389/FPSYG.2021.708375.

4- Feng, C., Azenkot, S. and Cakmak, M. (2015), "Designing a Robot Guide for Blind People in Indoor Environments", ACM/IEEE International Conference on Human-Robot Interaction, Vol. 02-05-Marc, pp. 107–108. 2.

5- Mada Assistive Technology Center Qatar. [Online]. Available: www.mada.org.qa. Mada is a resource centre that provides information on assistive technologies available for individuals with sensory disabilities.

www.mada.org.qa