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The Impact of Technological Innovation On Deaf and Hard of Hearing Communities

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The Impact of Technological Innovation On Deaf and Hard of Hearing Communities

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ABSTRACT

Over the past couple of decades, significant shifts have occurred in technological development. Among these advancements, the smartphone has emerged as an integral part of people's daily lives, serving as a powerful tool for accessibility and global connectivity. This literature review explores the ways in which everyday communication technology is utilized by Deaf and Hard of Hearing (DHH) individuals and examines the impact of its development on these communities. The goal of the work is to investigate how the evolution of modern smartphones contributes to breaking down communication barriers for DHH communities. This review focuses on smartphone features that enhance communication for DHH individuals, regardless of their geographical location or language differences. The ways in which smartphones enable DHH people to connect with others seamlessly will also be examined. Additionally, the review discusses the limitations in current smartphone technology and proposes future directions for research and development.

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Introduction

Deafness and hearing loss is defined as the inability to hear due to an impairment in one or more parts in the ear (ASHA, n.d.) This perspective views deafness as a condition that restricts what a person can do. However, to some Deaf and Hard of Hearing (DHH) people, Deafness is more than a diagnosis. For some, Deafness is an identity that provides people with a sense of community and is a safe space for Deaf and Hard of Hearing people around the world. Deaf culture highlights the positive aspects of Deafness by normalizing hearing loss and promoting equal access and opportunities.

An early technology that supported communication accessibility for DHH individuals was the teletypewriter (TTY). In the 1960s, the TTY, also known as Telecommunications Device for the Deaf (TDD), was the first technology that allowed DHH people to communicate with other TTY/TDD users through the telephone ("TTY and Relay Services", n.d.). People using the TTY/TDD could send and receive typewritten messages in real time. The TTY/TDD also had a relay service which translated written language into spoken language (Roos & Wengelin, 2015). Not only did TTY/TDD technology provide a method for phone communication among DHH individuals, it also supported phone conversations between DHH individuals and those without hearing loss. For DHH people, communication methods are a significant concern. Indeed, one of the first decisions for those who are diagnosed as DHH is that of how they will choose to communicate with others. Communication options for DHH individuals include manual communication such as American Sign Language (ASL) and oral communication. The method of communication selected may have significant effects on literacy, or reading and writing, development (Mayer & Trezek, 2023). Literacy skills are critical for DHH individuals because

they often rely on their reading and writing skills to communicate with the hearing world (Mayer, 2017). Consider the importance of supports such as closed captioning, which relies on adequate reading skills, for the DHH community. Written modalities are crucial for allowing DHH individuals access in academics, vocations, and socialization (Mayer & Trezek, 2023).

While TTY relay services still exist and continue to provide necessary telephone accessibility for members of the DHH community, many DHH individuals use newer forms of communication technology, namely mobile devices such as the smartphone ("TTY and Relay Services", n.d.). This literature review investigates how the evolution of modern smartphones contributes to supporting communication accessibility for DHH communities. Specifically, the ways in which smartphones support communication for DHH individuals regardless of geographic location or language differences through the functions of texting (or short message service; SMS) and social media applications will be the focus of this review.

Short Message Service (SMS)/Text Messaging

Short message service (SMS) or text messaging is a written communication method where users can send quick messages through a mobile phone/device. SMS has been used as a way to communicate since the early 1990s when the first cell phone with SMS availability was released by Nokia (Onion et al., 2022). Even with its 160 character limit, people use text messages to engage in personal and business-related conversations. Anyone with internet access is able to communicate with people worldwide through SMS or text messages, supporting modern communication across the globe (Tjiramanga, 2023). The majority of research on technologies with written communication features does not examine the effect these methods have on minority groups, including DHH individuals. However, a limited number of studies have

explored how Deaf people use SMS and text messaging features, to generate new and current perspectives on communication methods used by DHH communities.

Power and colleagues (2007) compared the usage of various written/text communication methods used by Deaf people in Germany to a similar study of Deaf Australians (Power, Power, & Horstmanshof, 2006). The purpose of Power and colleagues' (2007) study was to discover how DHH people interact with SMS technology in both countries and if the new SMS technology is fulfilling to members of these communities. Survey data was collected from 71 Deaf German participants incorporating the same questions as the Power and colleagues' (2006) Australian study. SMS was used by 96% of the participants and several believed that it is "the most useful feature" on their mobile phone (Power et al., 2007, p. 296). Participants reported using SMS to communicate with other DHH people as well as their hearing friends and family (Power et al., 2007). Power and colleagues' (2007) conclude that use of written communication technology aids in strengthening the connections between DHH individuals and the people closest to them. Additionally, the written component of SMS bridges the communication gap between DHH and hearing people because both parties can communicate in a mutual language. Power and colleagues (2007) gather that German Deaf individuals use the SMS feature for similar reasons and within the same quantity as the Australian group (Power et al., 2007). The use of SMS on mobile phones has given DHH the opportunity to communicate with DHH and hearing people instantly regardless of their geographical locations, thus reducing communication barriers (Power et al., 2007).

Okuyama and Iwai (2011) examined whether Deaf high school students in Japan use text communication technology the same way and for similar reasons as hearing students. The authors compared findings from Deaf high school students to a previous study (Okuyama, 2009)

about the texting habits of hearing high school students. Okuyama and Iwai's (2011) sample was unique in its focus on text message utilization of the adolescent population, individuals ages 15 to 20 years, because text messaging is the most frequent means of communication for youth (Okuyama & Iwai, 2011). The researchers administered a survey to 75 DHH students to assess the reasons for and frequency of texting within this group. Although there are more hearing participants, the average number of texts sent daily was similar across both groups (Okuyama & Iwai, 2011). Despite the Deaf participants living in the same campus residence and using sign language to communicate in person, text messaging appears to have been an effective way for them to communicate with peers. DHH students use text communication technology to make plans or engage in social activities (Okuyama & Iwai, 2011). Participants reported that texting was convenient because one can instantly communicate with people at any moment, regardless of their physical location.

Social Networking Sites (SNS) or Social Media

Social networking sites (SNS) or social media are terms referring to interactive digital technologies that allow people to create and share content, ideas, and information. Social media is used as a collective term to describe the websites, programs, and applications that people use. In the early 2000's, companies released platforms like MySpace, Facebook, and YouTube, that immediately garnered people's attention (Duong, 2020). Today, social media is used by billions of people around the world as a way to share knowledge and connect with others. Social media interests people because it offers real time interactions through diverse and unique methods like websites, texts, or videos (Duong, 2020). The rise of social media has led to study of the platforms by researchers from various disciplines.

Martzos and colleagues (2021) explored SNS utilization among DHH and hearing individuals in Greece. Prior to initiating their study, the researchers established that the Deaf community in Greece was using SNS, including Facebook, Instagram, and Twitter, as a way to keep members informed on matters that affected their community. Participants in the study included 49 Deaf adults and 229 hearing adults, all of whom were Greek (Martzos et al., 2021). Participants completed a survey to provide information on frequency, amount, purpose, and perception of SNS across both groups. Results suggested that both hearing and DHH people preferred to use desktops or laptops to access certain social media platforms, however, both groups used their mobile phones and laptops the same amount daily. The researchers proposed that participants' preference for laptops over smaller mobile devices may have been related to those devices' larger speakers and screens to support engagement within applications like YouTube or Pinterest (Martzos et al., 2021). With regard to specific platforms, Deaf participants reported a preference for Instagram when compared to other SNS platforms.

In addition to its role as a communication tool among DHH individuals, SNS is also useful for allowing people in the DHH community to gain more insights about other DHH people, culture, and news around the world. According to Martzos and colleagues (2021), DHH individuals are able to find and connect with other Deaf individuals more efficiently through SNS platforms. Results further suggest that DHH people communicate more frequently with hearing people through SNS than in person because these sites reduce language barriers between these groups (Martzos et al., 2021). For example, if communicating in person, DHH individuals may use manual sign language communication whereas their hearing counterparts use spoken language. SNS, on the other hand, capitalizes on the shared written language of the groups. Like SMS or texting, SNS provides DHH people the ability to communicate with others using written

language despite geographical location and language differences. SNS platforms such as Instagram and Facebook support the use of instant messaging, as well as live video chat, in which users can communicate using sign language and captioning functions (Martzos et al., 2021).

van Wier and colleagues (2021) analyzed whether people with hearing impairments in the Netherlands were using social media, smart devices, and applications in the same way and for the same reason as hearing people. Specifically, they wanted to understand why DHH individuals engaged with these applications, as well as the nature of benefits of using social media, and how DHH individuals compared to hearing people on these aspects (van Wier et al., 2021). The researchers administered a questionnaire pertaining to social media use to participants. Responses from 2016 to 2020 were examined, resulting in data from a total of 384 DHH and 341 hearing participants (van Wier et al., 2021). Results suggested that DHH and hearing individuals were not significantly different for weekly smart device use (smartphones and tablets). DHH individuals were more likely to use social media weekly through other devices (laptop or PC), a finding consistent with at least one other study (Martzos et al., 2021). However, DHH people still used smartphones to access social media throughout the week. Social media use daily or frequently throughout the day was reported for the majority of DHH and hearing participants. Results further indicated that social media was used significantly to communicate with friends, family members, acquaintances, and colleagues or peers (van Wier et al., 2021). Participants reported that using social media as a means of communication strengthened their relationships with family and friends. This study suggests that, as with other modern forms of communication such as texting, DHH individuals are able to benefit from the connectivity social media offers through the reduction of geographical and language barriers.

Conclusion

The purpose of this review was to summarize the available literature on the use of various modern communication technologies among DHH. The studies described here included relatively large sample sizes and found that smartphones and features like SMS and SNS/social media were used similarly among DHH and hearing individuals. Both groups use these technologies as a way to communicate with friends, family, and peers. SMS and social media allow DHH and hearing people alike to connect with anyone thus supporting the reduction of geographical and language barriers. The primary difference between the ways in which DHH and hearing people utilized these technologies highlighted the DHH people's preference for devices with larger speakers and screens (e.g., laptops rather than smartphones) for improved accessibility. Additionally, access to features that offer instant communication assists in strengthening the relationship between people and their friends and family.

Limitations

Currently, there is limited research on the ways smartphone features are used by DHH individuals and how these features might aid in reducing communication barriers. Of the published literature, most research was conducted in countries other than the United States. While this research is essential because it provides diverse perspectives and scientific knowledge, studies of DHH people in the United States would potentially yield greater generalization to our own country's population of DHH individuals in this country

Another aspect related to the generalizability of the studies reviewed here is that the majority of participants in these studies were adults between the ages of 18 and 75 years. Data from adolescents and children in the DHH community is lacking, and current studies do not delineate any differences on measures among age groups within their samples. For example,

current data do not identify whether DHH adults ages 65 years and older use SMS and social media differently than those in younger age groups.

Finally, it is important to note that adequate written communication skills are needed to engage with others via SMS and social media. Many DHH individuals' primary communication method is sign language. In the United States, American Sign Language (ASL) is considered the natural language of the Deaf community (Clark & Daggett, 2015). Other countries and regions have their own specific forms, including German Sign Language, Japanese Sign Language, Australian Sign Language, and many others (see Pfau, Steinbach, & Woll, 2012). Though they do not have written forms, sign languages are true languages which means that they do have rules and constraints for aspects such as grammar and word order (American Speech-Language-Hearing Association, 2019). While many DHH who use sign language as their primary method of communication are also taught the standard written language of their country (e.g., English in the United States), some DHH may not have the written communication skills required to use SMS and social media effectively. Therefore, these individuals may not benefit from technologies that rely on written communication.

Future Directions

In addition to the need for research on the use of smart devices and other technologies among DHH people in the United States as highlighted in the previous section, avenues for future research include investigating the utility of smartphone features like video chat and speech to text. Both of these technologies might be particularly relevant for increasing accessibility for DHH individuals, especially those who do not have strong written communication skills. Research on device features and applications that support communication through sign language in addition to written language is essential to improving accessibility and equity for those in the

DHH community, as is prioritizing technologies for the purpose of educating hearing people about Deaf culture to reduce communication barriers and ableism (Sanzo, 2021).

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