Deaf and Hard of Hearing Individuals' Perceptions of Communication with Hearing Colleagues in Small Groups

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ABSTRACT

This survey-based study investigated the the perception of deaf and hard of hearing (DHH) individuals' perceived need for technologies that may facilitate communication when meeting in small groups with hearing colleagues. Participants were 108 DHH postsecondary students who participated in co-op (internship) and capstone experiences at workplaces with hearing employees within the past two years. Participants' responses to a survey indicated that they were generally not satisfied with their current strategies and technologies for communicating with hearing persons in small groups.

CCS Concepts

• **Human-centered computing → Accessibility → Empirical studies in accessibility** • **Human-centered computing → Collaborative and social computing → Empirical studies in collaborative and social computing**

Keywords

Deaf; hard-of-hearing; small groups; communication; survey

1. INTRODUCTION

A variety of methods are available to provide accessible information during meetings, classes, and live events for people who are deaf or hard-of-hearing (DHH); this includes sign-language interpreting and as well as live-captioning services, in which a trained provider uses a computerized system to transcribe the spoken information, with the words displayed on a screen for those in attendance. Having reliable access to a signed or text version of the spoken information aids DHH individuals' understanding and effective participation in educational or employment settings.

Automatic Speech Recognition (ASR), software that converts audio input of human speech into text displayed on the screen, holds exciting promise for making spoken content accessible for people who are DHH – especially when access services such as captioning/transcription performed by a human are currently not provided or are prohibitively expensive.

Prior studies have investigated DHH individuals' acceptance of

ASR technologies [4], fully automatic captioning of classroom lectures using ASR [6], professional re-speaking of classroom content to semi-automate caption production [3], or the use of human workers to repair ASR errors [1]. While state-of-the-art ASR is still imperfect, especially in the noisy and complex audio environment of multi-party meetings, in this work, we focus on supporting communication in one-on-one meetings or small groups. In contrast to a lecture context, in small group meetings, the potential that communication partners may adapt their speaking behavior could increase the likelihood of ASR success.

This study investigated DHH individuals' perception of the need for technologies and strategies that will facilitate communication between deaf and hearing colleagues in small groups. Prior to conducting technological research and development on using ASR in small teams with DHH and hearing colleagues, it was important to first determine the DHH individuals' attitudes about the need for improving communication with hearing teammates. If DHH individuals were to report that they experience significant difficulties communicating with hearing teammates, even with the use of current technologies and strategies, this finding may justify exploration of use of ASR, and possibly other technologies, as technological solutions to facilitate communication.

The study addressed two questions: (a) To what extent were the current strategies that DHH individuals used satisfactory for communication in teams? (b) What were the relative preferences among various technologies and strategies used for communication?

2. METHOD

The participant pool for this study consisted of postsecondary students (n=379) who are deaf or hard of hearing and who participated in co-op (internship) and capstone experiences at workplaces with hearing individuals within the past two years. The invitation to participate was transmitted by email and included a link to the survey. Respondents who offered contact information received a $20 gift card for their participation.

The survey consisted of 16 questions, including multiple-choice, Likert-scale type, and open-ended short-answer questions. The survey was created using the Survey Monkey survey tool. Following the methodology of prior studies published at ASSETS [2, 5], our online survey of DHH participants was presented bilingually with questions provided in the form of ASL videos and redundantly as onscreen English text. The videos were prepared by students whose first language is ASL, and the quality of the ASL videos was analyzed by a professor of ASL-English Interpretation who is a native ASL signer.

2. RESULTS

2.1 Participants.

For this study, survey responses were analyzed using descriptive statistics. The survey was completed by 108 respondents for a response rate of 28%. Respondents were: enrolled in college full-time (n=69); working (n=28); or graduated and unemployed (n=5). 73% of respondents preferred to use American Sign (ASL) either alone or in combination with voice. In contrast, on average, 66% of respondents regularly interacted with individuals who did not know American Sign Language.

2.2 Communication Strategies

For both one-to-one and small group meetings, respondents were asked whether they had tried technology-based and non-technology-based communication strategies and to rate their satisfaction with each (1=not at all satisfied, 4=very satisfied). Table 1 displays the strategies and complete results. In one-to-one meetings the top 3 technology-based strategies used were: email before or after meetings (94%; average satisfaction 3.06/4.0); writing on paper (84%, average satisfaction, 2.44/4.0); and texting (82%, average satisfaction, 2.59/4.0). In small group meetings, the top 3 technology-based strategies were email before or after meetings (88%, average satisfaction, 2.67/4.0); writing on paper (79%, average satisfaction 1.99/4.0); and using a computer word document (72%, average satisfaction 2.04/4.0).

Table 1: Technology-based and Non-Technology-based Communication Strategies Reported by Participants

Strategy	One-to-One Meeting % used strategy; (number of responses) avg. satisfaction with strategy (std. dev)	Small Group Meeting % used strategy, (number of responses) avg. satisfaction with strategy (std. dev)
Technology-based Strategies		
Write on paper	84 (104) 2.44 (1.41)	79 (103) 2.16 (1.38)
E-mail before/after meeting	94 (103) 3.06 (1.09)	88 (103); 2.67 (1.27)
Computer word document	75 (104) 2.29 (1.54)	72 (103) 2.04 (1.51)
Notes phone app with typing	65 (104) 1.93 (1.60)	56 (103) 1.55 (1.57)
Notes phone app with voice recognition	51 (104) 1.32 (1.53)	49 (103) 1.25 (1.51)
Texting	82 (104) 2.59 (1.45)	67 (103) 1.89 (1.58)
Chat programs on computer/phone	70 (104) 2.13 (1.60)	64 (103) 1.75 (1.51)
Share pictures	55 (103) 1.60 (1.64)	54 (103) 1.42 (1.53)
Non-Technology based Strategies		
Voice	73 (103) 2.14 (1.43)	75 (102) 1.81 (1.34)
Speech-reading	88 (101) 2.30 (1.28)	83 (103) 1.82 (1.22)
Gestures	86 (103) 2.29 (1.21)	85 (101) 1.99 (1.15)

3. CONCLUSION

The results of this survey indicate that while students relied on ASL as a primary form of communication, they were frequently in work situations where the majority of their interactions were with individuals who did not know ASL. Respondents reported that they relied on a variety of strategies to communicate in the workplace. The most frequently used technology-based strategy, email before or after meetings, did not afford individuals who are DHH with a real-time means of participation in work meetings. Other strategies relied on potentially cumbersome approaches such as writing on paper, texting, or using a word-processing program. Results of this survey suggest the need for new strategies or technologies for real-time communication for individuals who are DHH in the workplace. In future work, we will investigate the use of ASR-based technologies in this context.

3. ACKNOWLEDGMENTS

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