Verification of Assistive Technology Utilized in Virtual Learning
Rebekah Havens, B.S. and Linda Thibodeau, Ph.D.
The University of Texas at Dallas

ABSTRACT
Due to the COVID-19 pandemic, many students with hearing loss were required to learn virtually in their homes, while still receiving their public school accommodations, including remote microphone technology. The purpose of this project was to evaluate three virtual learning arrangements to determine acoustic characteristics of the transmitted signals. Measurements were made with three different web-based conferencing systems (Teams, Zoom, and Google Meet) and three listening arrangements (speakers, wireless connection, and remote microphone). The most variability in the acoustic signal occurred when speech was received through speakers of a laptop.

INTRODUCTION
Children with hearing loss face educational challenges in the classroom, as well as at home, because they do not have consistent access to sound across the speech frequencies, which are critical to expressive and receptive language development (Hoff & Naigles, 2002).

PURPOSE
The purpose of this project was to verify the devices used by children with hearing loss in an effort to determine the acoustic impact of virtual connections with assistive technology. The research questions were: Compared to a typical classroom condition, are the acoustic characteristics of the talker maintained as the signal passes through a hearing aid (1) when traveling through three different web-based conferencing systems? (2) when using three different listening arrangements?

METHODS
Two testing arrangements were used: 1) A typical in-person Classroom Setup in one room: Control (Non-virtual) Figure 1, and 2) A remote-learning Classroom Setup in two rooms (Virtual) Figure 2.

Three conditions were used to simulate virtual learning environments: Condition 1-Hearing Aid in Soundfield (HA/SF); signal was received by the hearing aid worn by KEMAR via the speakers of the computer Condition 2-Bluetooth; signal was received via a Bluetooth connection between hearing aid and the computer Condition 3-Remote Mic; signal was received via a digital modulation connection between the hearing aid and a Phonak Roger Touchscreen, which was hard-wired to the computer.

RESULTS
The output of the hearing aid is shown for the non-virtual condition (Figure 4) and the three virtual conditions (Figure 5).

To compare output across the platforms, the RMS difference between Non-virtual and Virtual setups was calculated for each listening arrangement (Figure 6).

When comparing listening arrangements, the remote microphone condition and Teams platform showed least variability in output.

CONCLUSION
There is a need for audiological intervention in virtual learning environments for students with hearing loss to ensure audibility is optimal.

A protocol is needed to assess the electroacoustic analysis of assistive technology interfaced with personal computers used by students with hearing loss in virtual learning environments.

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REFERENCES
