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Belonging, Being and Becoming:

Supporting the Communication Experiences of Teens with Hearing Loss

ABSTRACT

Understanding the needs of teens with hearing loss in their communication environments is crucial to support their meaningful participation. Wind noise and sudden sounds may create barriers to communication and negatively impact participation. These elements of communication environments were investigated with teens who wear hearing aids. Results showed that Oticon Real managed wind noise and sudden sounds better than their current hearing aids. Self-rated listening fatigue was also lower with Oticon Real.

EDITORS OF ISSUE

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Introduction

The World Health Organization's (WHO) *International Classification of Functioning, Disability and Health* (ICF) has developed a conceptual framework for hearing care professionals to consider when working with teens who have hearing loss (World Health Organization, 2001). Participation, an individual's involvement in life situations and their ability to execute tasks in a specific environment, is a key element of the ICF framework (World Health Organization, 2001). The WHO recommends considering a more contextualized view of the teen, recognizing that their function is impacted not only by their hearing loss, but also their social environment and unique personal factors (Moodie, 2022).

What is meaningful participation?

Meaningful participation reflects the amount or level of engagement, and the positive feelings of being able to contribute to our own important, interesting, and enjoyable activities. (Moodie, 2022; Palisano et al., 2012). The components of meaningful participation are environmental factors, body function and structure, activities, and personal factors (Figure 1). *Environmental factors* are the physical, social, and attitudinal environment in which individuals live and conduct their lives. *Body function and structure* are the physiological functionality of their body systems. *Activities* are the execution of a task or action by an individual. *Personal factors* are the unique background of an individual's life and living, including the features and contexts that are not part of having a physical or intellectual difference (Moodie, 2022; Palisano et al., 2012).

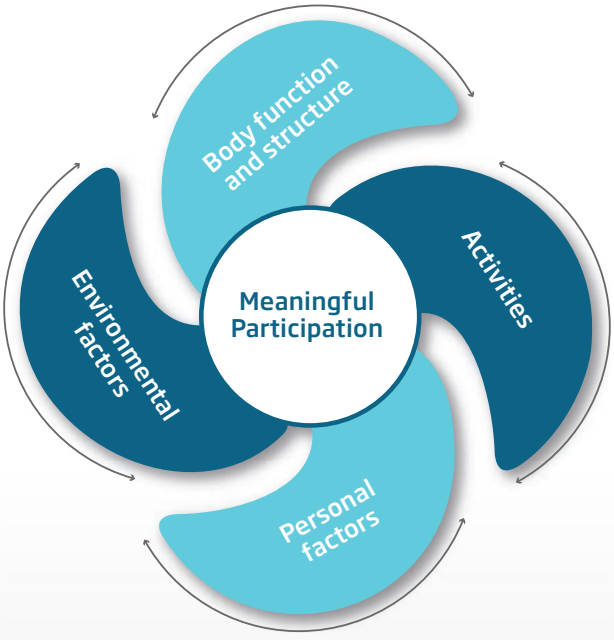

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Figure 1. Meaningful participation

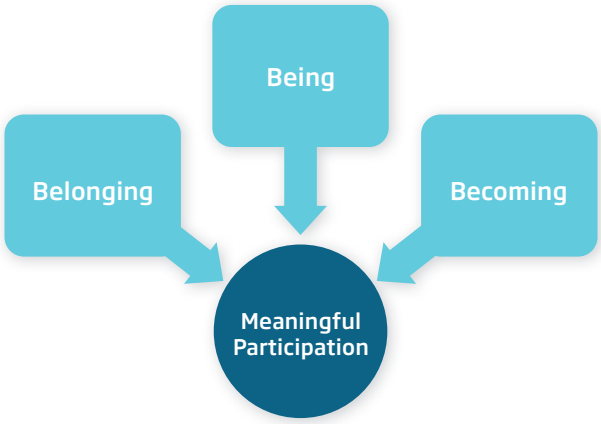

Figure 2. Belonging, being, and becoming supports meaningful participation.

How can hearing aid technology support meaningful participation for teens with hearing loss?

For teens, developed constructs of belonging, being and becoming are important facilitators towards meaningful participation (Figure 2) (Willis et al, 2016). The "Being" or self-identity is developed through their experiences and relationships. "Belonging" is developed and supported through access in their communication environments that support social interactions. "Becoming" is an exploration of their aspirations for the future as supported by self-confidence and self-determination.

For teens with hearing loss, hearing aids that support communication access is critical to promote their meaningful participation (Dammeyer, 2010; Antia et al., 2011). This means their hearing aid technology must provide speech understanding in simple and complex environments. Previous interview research with teens found that the presence of sudden, unexpected loud and soft sounds disrupted their communication. In addition, speech understanding in outdoor environments with wind noise was also challenging (Gordey, 2020).

Oticon Real is the latest addition to our portfolio of life-changing hearing aid technology. Oticon Real delivers new technology features to manage wind noise, handling noise and disruptive sudden soft and loud sounds. The Wind & Handling Stabilizer and SuddenSound Stabilizer, the new features in Oticon Real, are another huge technological leap forward to support teens with hearing loss.

Wind and handling noise

Researchers have reported wind noise to be potentially disruptive for speech understanding and listening comfort for those who wear hearing aid technology (Korhonen, 2021; Keshavarzi et al., 2018). Daily social activities such as walking with family and friends, playing outdoor sports, and eating outside may present challenges for good communication. Conventional hearing aid technology allows wind to enter both microphones with little consideration and management. As a result, the noise management system in the hearing aid may be negatively impacted, reducing the efficiency of the system. Speech understanding, participation in conversation, and confidence in communication may be reduced in environments with wind (Korhonen, 2021; Kelly et al., 2013). Handling noise refers to the sound that is generated when contact is made with the hearing aid and/or microphone while it is being worn.

The Wind & Handling Stabilizer in Oticon Real detects and manages wind and handling noise 500 times per second. By selecting the hearing aid microphone that has received the cleanest sound input, it prevents the compromised sound from the other microphone from entering the system. Wind and handling noise from the specific microphone are attenuated efficiently and focus on reducing gain in frequencies affected by the noise. A detailed, technical explanation of Wind & Handling Stabilizer can be found in Wind & Handling Stabilizer – Evidence and User Benefits (Gade et al., 2023).

Research was conducted by Gade et al., 2023 to investigate the benefits of the Wind & Handling Stabilizer in Oticon Real. In their first technical measurement, they found that Oticon Real removed wind noise more effectively than Oticon More and provided better access to speech (Gade et al., 2023). Additional technical measurements compared Oticon Real to three competitor hearing aids. Oticon Real provided superior comfort and enhanced speech clarity in windy situations compared to competitor hearing aids (Zapata-Rodriguez et al., 2023). Little research is available on the effect of handling noise with hearing aid users. However, anecdotal reports suggest that simple actions such as brushing hair or adjusting the hearing aid program switch created noise that was irritating and bothersome. Technical measurements were made for these types of handling noise. Oticon Real showed better reduction of handling noise when compared against two competitors. (Gade et al., 2023).

"When I brushed my hair away from my ears, I touched my Oticon Real hearing aids and was surprised how quiet the sound was."
Sandra, 20 years old.

Sudden sounds

Sudden sounds are present in everyday life and may occur thousands of times per day. Examples of a loud, sudden sound is a book falling to the floor or a door slamming. A soft sudden sound may be fingers tapping on a keyboard or shoes clicking against a tile floor. Sudden sounds are characterized by three main features: 1). a very fast onset of approximately 1 millisecond, 2). a very fast decline around 10 milliseconds, and 3). short duration up to one second (Dyballa et al., 2015). Traditional hearing aid technology typically has addressed loud sudden sounds by activating their compression systems without consideration to other sounds in the environment. Although this may reduce the loudness of the sudden sound, it may also reduce speech, affecting communication. Because these sounds start and end rapidly, they require a unique system, different from typical hearing aid compression systems. In Oticon Real, new detectors form SuddenSound Stabilizer, a system that efficiently monitors the sound environment. It rapidly adapts amplification to keep soft and loud sudden sounds available, balanced, and comfortable. SuddenSound Stabilizer can manage at least 500,000 sudden sounds per day. A detailed, technical explanation of SuddenSound Stabilizer can be found in *SuddenSound Stabilizer – Evidence and User Benefits* (Santurette et al., 2023). The benefits of this new feature were documented in a study by Santurette et al., 2023. They found that Oticon SuddenSound Stabilizer preserved speech signal integrity and provided good attenuation across different sudden sound sources. In addition, they discovered that SuddenSound Stabilizer reduced listening effort and the desire to "give up" when listening to speech in the presence of sudden sounds (Santurette et al., 2023).

Clinical Study with Oticon Real and Teens

The objective of this study was to investigate the how hearing aid technology supports meaningful communication participation in teens who wear hearing aids. The study aimed to address two questions:

1. How do the advanced hearing aid features in Oticon Real support the meaningful communication participation of teens with hearing loss in environments with wind noise and sudden sounds?

2. In teens with hearing loss, do the advanced features in Oticon Real impact listening related fatigue during communication?

Materials and Methods

Ten participants (n=10), between the ages of 11 and 20 years old, with mild to moderate-severe sensorineural hearing loss in both ears and wearing bilateral hearing aids were recruited from four clinical audiology practices in Canada. Their current hearing aids (Oticon and pediatric competitor) were less than four years old and prescribed and fitted using best practices (Scollie et al., 2005; Bagatto et al., 2005) Participants communicated using spoken English and had no identified cognitive disability.

Participants completed two questionnaires during the study: 1). The Vanderbilt Fatigue Scales (VFS-C) and 2). Communication Experiences of Teens Questionnaire. The VFS-C is a validated, self-report, ten-item, questionnaire that measures listening related fatigue in children and teens with hearing loss (Hornsby et al., 2022). The Communication Experiences of Teens Questionnaire is a self-report, ten-item questionnaire rating challenging listening environments (Gordey, 2020). It included ratings of using hearing aids in environments such as school, stores/shops, restaurants and outdoors. In addition to the questionnaires, each participant completed a semi-structured interview by phone or online using ZOOM or TEAMs. An interview guide was developed for the semi-structured interview. Examples of questions were: Tell me about your experiences being in difficult communication environments? Tell me about your experiences using the hearing aids outside when there is wind or sudden loud sounds.

The mixed methods clinical study consisted of three phases.

Phase one: Participants completed the two questionnaires and reflected on their experiences with their current hearing aids. Participants were then fitted with Oticon Real rechargeable hearing aids (mini-RITE and mini-BTE). Similar to their current hearing aids, the Oticon Real were fitted to DSL v5.0 targets and verified using real ear measures. Participants were invited to wear the study hearing aids for approximately two weeks.

Phase two: After wearing the hearing aids, participants completed the two questionnaires again and reflected on their experiences wearing the Oticon Real hearing aids.

Phase three: Following the completion of the questionnaires, the semi-structured interviews were conducted, and participant responses were audio recorded and recordings were transcribed by a certified transcriptionist. Transcripts were coded and thematic analysis completed.

Results

Questionnaires

Findings from the VFS-C indicated that eight out of the ten participants rated experiencing lower levels of listening fatigue with the Oticon Real hearing aids compared to their current hearing aids (Figure 3).

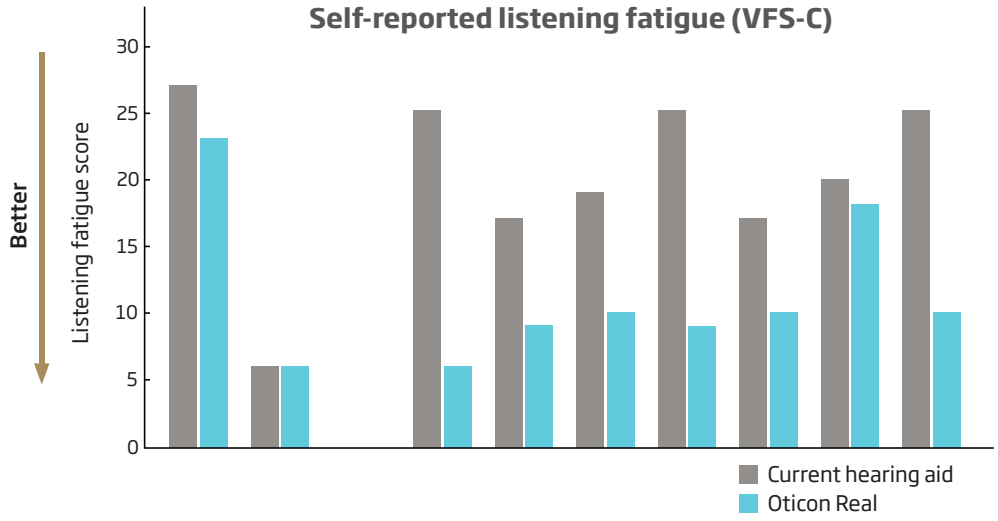

Figure 3: Ratings of listening fatigue in teen hearing aid users. Higher scores indicate more fatigue as rated by the participant.

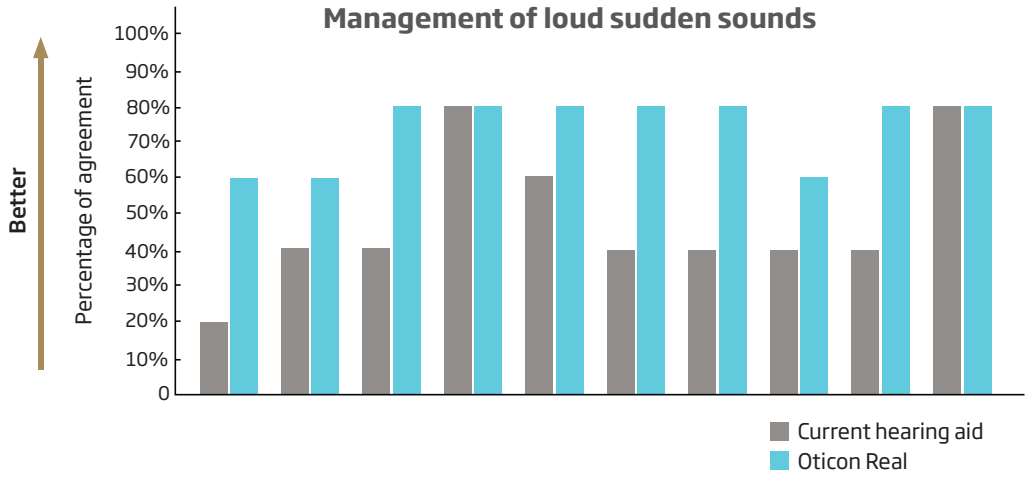

Figure 4: Ratings for management of loud sudden sounds. Percentage of agreement reflects improved comfort.

A key finding from the Communication Experiences of Teens Questionnaire was the management of sudden, loud sounds when wearing hearing aids. Eight out of ten participants rated Oticon Real to be better at handling sudden sounds compared to their own hearing aid (Figure 4).

Semi structured interviews with teens

Teen interviews provided some insights into wearing their own hearing aids and using Oticon Real. Major themes that emerged were: the importance of self-confidence, the need for communication access, engagement, and participation (Figure 5).

Figure 5: Interview themes.

The first theme was the importance of self-confidence. Participants relied on their hearing aids for learning, social activities, and communication at home, school, and in their community. When reflecting on using their own hearing aids, participants described avoiding situations where they could not hear because it affected their self-confidence. Participating in activities on windy days or taking walks near construction sites were reported to negatively impacted their speech understanding. After wearing the Oticon Real hearing aids, most participants noted improvement in their speech understanding when exposed to wind noise. Teens described feeling certain about their understanding of conversations and this had a positive effect on their self-confidence.

"I find the Oticon Real hearing aids are so much better dealing with chatter and noise. Before it was hard to talk to someone in the hallway at school, and I was not sure what they would be saying, but now its totally fine."
Jack, 18 years old.

"I was walking outside with a friend, and it was really windy. With the Oticon Real hearing aids I had no problem hearing my friend and it made me feel really confident about what was being said. There was no lull in the conversation it just felt normal"
Sandra, 20 years old.

The second theme was the need for communication access. Communication involves understanding and being understood. For teens with hearing loss, some environments have barriers that reduce communication access (Gordey, 2020). Findings showed that participants described not using hearing aids or avoiding communication as a strategy to managing very challenging listening environments with their own hearing aids. After being fitted with the Oticon Real hearing aids, participants described improved communication access, and commented that they could hear talkers in listening environments with sudden soft and loud sounds.

"Usually, I would take my hearing aids out when I would go to work at the bakery and grocery store. The crashing of the grocery carts and the alarms going off for ovens made it hard to hear. With the Oticon Real, those sounds feel like they are in the background, and I am able to focus on the person who is talking."
Jack, 18 years old.

"With my other hearing aids, when a loud sound happened quickly, it would be at the same level as the person I was talking to and it would overtake their voice. Now, with the Oticon Real I can hear the person much better because the loud sound is reduced and put into the background"
Jordan, 17 years old.

The third theme was engagement. Skinner et al., 2009 described engagement as the quality of the involvement and connection to activities in their environment. Teens described hearing in wind with their own hearing aids as a barrier to engagement. Furthermore, it reduced their ability to become fully involved in outdoor activities. After using Oticon Real, participants described becoming more engaged. Because their speech understanding was so much better outdoors, playing sports and going for walks was more enjoyable.

"I was at track and field, and we were practicing Javelin outside. With the Oticon Real hearing aids, I could actually hear the coach reading off the measurements of how far everyone was throwing. I never could hear that before."
James, 16years old.

The final theme was participation. Antia et al., 2011 reported that when teens with hearing loss perceived their communication access to be poor, their participation was negatively impacted. Therefore, having hearing aid technology that supports communication is vital. In the current study, interviews with teens highlighted the importance of having hearing aid technology that supported their participation. After using Oticon Real hearing aids, participants described more options to participate in their learning environments, social settings, and outdoor places compared to their own hearing aids. Increased participation was reported when wearing Oticon Real for outdoor activities in wind noise and in work and learning environments with sudden sounds.

"Everything sounds so comfortable with the Oticon hearing aids. I am not used to hearing sound this way."
Jordan, 17 years old.

"With the Oticon Real hearing aids, outside is easier. The wind is not a big deal anymore. Before I had to walk right up to people to hear, now I can stand at a distance and still hear."
Will, 17 years old.

Conclusion

This study provides an initial understanding of how advanced hearing aid technology can support meaningful participation for teens with hearing loss. Compared to their own hearing aids, most participants fitted with Oticon Real demonstrated improved communication access in environments with wind noise and sudden sounds. Research has shown that listening related fatigue may impact learning, cause increased stress, and reduce concentration (Hornsby et al., 2022). For most participants wearing Oticon Real, lower levels of listening-related fatigue were reported compared to their own hearing aids. The technological advancements in Oticon Real are ready to support the unique amplification needs of teens with hearing loss. Whatever complex listening environment they face, they can do so competently.

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