Institute of Transport Economics
Norwegian Centre for Transport Research

ENGLISH Summary

Indoor sound quality

How does it affect people with hearing impairment?

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There are around 300,000 hearing impaired people in Norway. Hearing problems increases with age. Around 50% of survey respondents stated that they "always/often" had difficulty hearing what was said in situations with background noise in their homes. Several also stated that they deliberately chose rooms without background noise when talking to someone. Many homes have an open kitchen/living room-solution, large windows, parquet floors and exterior walls in brick. These factors can lead to long reverberation and thus reduced speech understanding, if measures are not taken to improve the sound quality. To reduce the disadvantages, it is important to ensure that new and existing homes are adapted to a life-cycle standard, i.e. that they must be universally designed and also adapted to people with hearing challenges. It is possible to make physical adjustments to the home to improve sound quality, this can for example be sound-absorbing materials in the wall/ceiling/floor, or the use of soft furniture, carpets, thick curtains, etc. In addition, it is possible to use technical aids to improve speech/sound understanding.

In Norway, around 300,000 people are hearing impaired. Demands for densification make the homes smaller, and the desire to build near traffic junctions can lead to more residential buildings being exposed to noise. At the same time, the use of a home office increases the importance of good sound quality in the home, especially for those with hearing challenges. It is therefore important that homes in Norway are designed so that the problems caused by impaired hearing are reduced. The purpose of the project described in this report was to investigate whether sound quality in Norwegian homes presents special challenges to the hearing impaired and how this affects their quality of life. Difficulties as a result of the Covid-epidemic and the use of the dwelling? What is important to consider when it comes to sound quality in housing for the hearing impaired? What experiences are gained internationally?

Few international studies on the topic

We found very few studies of how people with hearing loss experience the sound environment in their own home. The results indicate that noise annoyance among people with hearing loss does not differ significantly from people with normal hearing, but the knowledge base is too weak to draw clear conclusions. When it comes to covid-19, the literature shows that the use of masks makes communication more difficult, and the same applies to communication via digital platforms. Home offices and digital communication have become more widespread even after the pandemic. It is important to raise awareness concerning communication

challenges for people with hearing loss both in the event of future pandemics and in the new digital everyday life.

Noise annoyance at home - about the same for those with and without hearing problems

The proportion of hearing-impaired people who are bothered by noise in general, as well as by speech, media use etc. (from neighbours) are roughly the same as for those who are not hearing impaired. But this may depend on the setting. Hearing-impaired people are somewhat less bothered by loud music with bass and drums through the wall/floor/ceiling, footsteps from neighbours who live above, as well as footsteps from stairwells, hallways and corridors. Around 40% state that they experience the authorities' sound requirements for housing as too lax, and the responses from the hearing impaired did not differ from people without hearing problems. Some also stated that they were willing to pay to improve the sound quality in their home.

Many hearing impaired experience poor sound/speech quality in their homes

Almost 50% of respondents with hearing impairment stated that they "always/often" had trouble catching what was said when the extractor/dishwasher was on, see figure S.1. Another approximately 35% state that this was "sometimes" a problem. Most people who have hearing problems need to concentrate extra to hear what is being said or to interpret where different sounds come from.

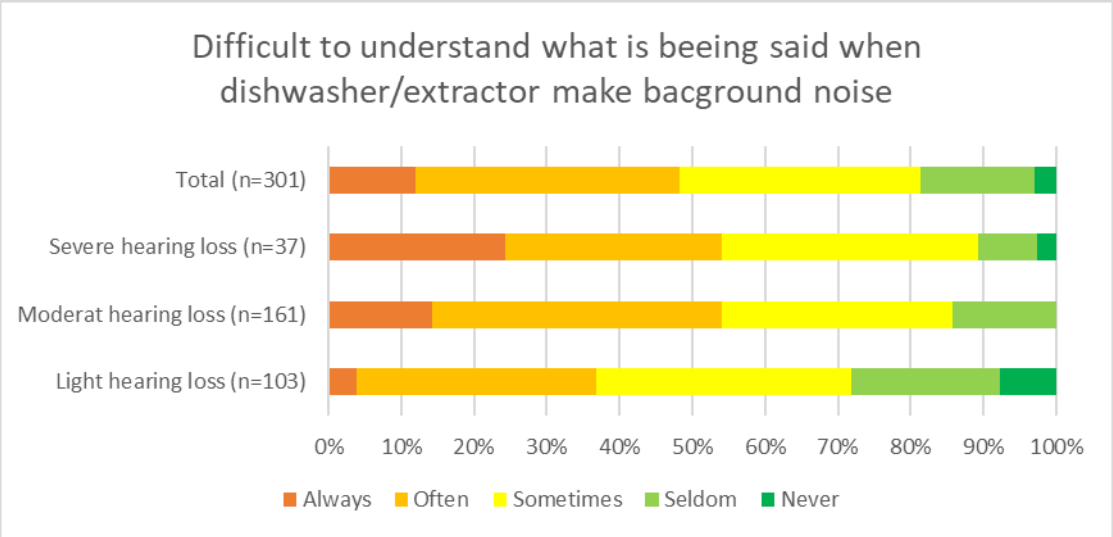

Figure S.1: Assessment of how often it is difficult for hearing impaired to understand what is being said when the extractor /dishwasher produce background noise. In relation to self-reported hearing problems. In percentage.

Over 40% of the hearing impaired stated that they "always/often" became tired or stressed due to their hearing problems. In total, around 90 % reported that they sometimes became tired or stressed as a result of their hearing problems. How tired/stressed one becomes may vary depending on the situations one finds oneself in, and how important it is to keep track of what is being said or what is happening. Around 60% state that they "always/often" get tired

when they have friends or family visiting their home. Not surprisingly, one gets more tired in situations with other people, than when for example watching TV.

Around 50% of those who had had digital meetings found it more difficult to understand what was said than at physical meetings, while some students/pupils thought it was easier to understand what was said on Teams-meetings due to less background noise. More than 20% of those who use a PC in their home office have had their PC adapted to improve the sound quality.

Only 4% stated that the sound quality in their own home was poor, and the same proportion had made physical improvements to their own home to improve the sound quality, such as sound-absorbing panels in the ceiling and walls and sound-insulated doors. Most of the people who had carried out measures in their homes stated that the changes had led to improvements in the sound quality. It was mentioned that it would have been an advantage if a person from the Hearing Center/Hearing Aid Center could come to people's homes to assess which improvements to the home/aids that were possible.

Interviews with two hearing impaired

It proved difficult to recruit people for the interviews, and only two people were interviewed, both women of working age with young children. Both live in a detached house/terrace. Both find various forms of background noise challenging, and one uses SMS as a tool to communicate with her husband at home. The other woman uses aids such as an alarm clock with vibration and fire alarms and a baby call with a screen.

Both emphasize the importance of having rooms with doors that can be closed. None of the participants have made major changes in terms of sound quality in the home, but they have made minor changes, such as hanging textile art, shelves on the walls, curtains in the windows and using wall-to-wall carpeting. Both participants experience the access to information as too poor when it comes to measures that can be taken to improve the sound quality in their home.

Conclusion

The knowledge base when it comes to how people with hearing impairment are affected by sound quality in housing is generally tenuous, and more research is needed. The report indicates that there may be a need for guidance on how physical measures can help reduce problems related to hearing loss at home. It may seem that people with hearing loss often do not attribute the problems they experience to the buildings physical/technical conditions, even if those who have implemented measures in their homes feel that it has helped them.

When it comes to choosing physical solutions to improve acoustic conditions in the home, it is an advantage if the chosen solutions are adapted to the lives and needs of the user. Different solutions may be suitable for different sound frequency ranges, i.e. the use of the room can affect how well the selected solutions will work. It is also important to take air quality and any allergies into account when choosing a solution.

About the study

The report presents results from:

- an international literature review
- two surveys
    - a reanalysis of data from a 2016 survey on sound requirements and noise annoyance in homes (700 participants, both with and without hearing impairment)
    - a survey among members of the National Association of the Hearing Impaired (307 participants). The topic was sound quality and speech understanding in one's own home, challenges related to working from home and the use of technical aids, and whether physical changes had been made to improve sound quality.
- In-depth interviews about experiences with sound quality and measures in the home to improve conditions for people with hearing challenges.

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