Fig. 1: Data analysis in Grounded Theory Methodology

Background:
- Listening effort is the mental exertion required to attend to, and understand, an auditory message (1). Listening effort, intensified with hearing loss, impacts upon an individual's functioning (2) and participation in daily activities (3,4).
- The theoretical basis of listening effort is not yet understood clearly (1).

Research Question:
What are adults' with post-lingual hearing loss (and their significant others') perceptions, understanding and experiences of:

- listening effort
- listening-related fatigue
- future listening effort before and after cochlear implantation?

Methods:
- A qualitative focus group study using constructivist Grounded Theory (5).
- Recruitment: Adults with severe-to-profound acquired hearing loss referred for CI. Sampling was purposive with maximum variation from a local cochlear implant centre.
- Participants: 52 invited/24 consented/n = 18 participants
- Focus groups were audio-recorded, transcribed verbatim and anonymised.
- Data Analysis: Transcripts were subjected to open coding, an iterative process of reviewing the transcripts line-by-line and attaching concepts to data. Codes emerged from the data and were not pre-determined. Focused coding grouped the open codes into provisional conceptually-related categories. Relationships between categories were explored for process. Memos and diagrams were used to develop the conceptual model.

Results:
- Perceived listening effort is a multi-dimensional construct (Fig. 2):
  - Attending – Focusing attention on an auditory stimulus.
  - Processing - The recruitment of cognitive resources to the decoding of an auditory signal.
  - Compensating - The strategies/behaviours employed to reduce the impact and/or intensity of listening effort.
- Unexpected findings (Fig. 3) prompted further analysis and emergence of the core category – listening effort as a process of seeking connectedness’ (Fig. 4).
- Social connectedness is the feeling of being connected to one’s social (i.e., “hearing”) world (6). It is a basic human need and it drives investment of listening effort.
- Failure to validate (i.e., low) social connectedness despite high effort produces an effort-reward imbalance (7).
- Effort-reward imbalance leads to further disconnecting (experienced as social isolation and self-alienation).
- Disconnecting has negative consequences for quality of life, mental health and well-being.
- Post-implant: A CI provides access to an improved, albeit imperfect, auditory signal. When combined with high listening effort, a CI enables social connectedness. By fulfilling this fundamental human need, continued high listening effort post-implantation is reconciled by recipients as acceptable.

Fig. 2: Dimensions of perceived listening effort

- Attending
- Processing
- Compensating

Fig. 3: Handling unexpected participant data - exploring for process

A process of seeking connectedness

- "Effort is a subjective thing as much as anything else. When it’s rewarded it’s not so effortful.
- "You’ve got your family around you watching this and them also feeling you are dead to them in the way they can’t communicate with you without putting in a lot of effort."
- "Because you feel connected again. You know how you probably can never imagine what it feels like that you don’t make a sound. That when you put one foot in front of the other you don’t make a sound. When you touch the table you don’t make a sound. You don’t exist. In space."

Fig. 4: A Grounded Theory of perceived listening effort as a process of ‘seeking connectedness’

Validating
- Trying so hard
- Investing listening effort

Disconnecting
- Struggling to fit in
- Blaming others
- Withdrawing
- Declining well-being

Restoring connectedness & re-connecting listening effort
- Changing qualities of listening effort
- “Being back”
- Accepting imperfect hearing
- Being content

Conclusions:
- Qualitative methods bring the patient voice into the study of listening effort.
- Listening effort is linked intrinsically to the well-being and quality of life of adults with severe-to-profound acquired hearing loss.
- Psychological (e.g., motivation) and social factors are important to the measurement of listening effort. Previous limited consideration of these variables may account for the lack of agreement between the objective and subjective findings reported in the literature.

Impact:
- This Grounded Theory, the first qualitative investigation of perceived listening effort, informs a more holistic understanding of listening effort, complementing quantitative studies utilising objective, psycho-physiological and behavioural measures.
- Supports evidence-based, person-centred interventions for high listening effort post-CI.

References:

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