

A Questionnaire Suitable to Assess Listening Effort in Children and Adults

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Introduction

Listening in noisy situations is known to be more effortful than in quiet environments for adults and especially for children. Listening effort is defined as the cognitive, attentional, and perceptual processing resources required to understand and process speech [1]. One way to measure the subjective perception of listening effort is through questionnaires. In this study published in Seitz et al. (2024), a questionnaire was developed to subjectively assess listening effort in children aged six to ten and adults[2]. It was hypothesised that the subjective listening effort measured by the developed questionnaire would be higher in noise than in silence.

Questionnaire

Subjective assessment of listening effort can be quantified through targeted self-report measures. Visentin and Prodi[3] demonstrated this approach by asking 11-13 year olds “How much effort did doing this task require?”, revealing higher self-reported effort ratings in noisy conditions compared to quiet environments. However, Francis and Love[4] proposed a more all-encompassing assessment of subjective listening effort based on their literature review, including well-being, task performance, and perceived effort. It was argued that when participants answer questions about listening effort, they may also be addressing their well-being and perceived performance[4]. Based on these findings, this study developed three questions to categorise participants’ effort across five different classroom noise conditions: no noise and children’s multi-talker babble noise in anechoic and reverberant environments with signal-to-noise ratios of 0dB and -3dB. Participants answered the following questions (originally in German)[2]:

1) **Wie geht es Ihnen/dir gerade in diesem Moment bei dem Hörversuch?**

Sehr gut, gut, mittelmäßig, schlecht, sehr schlecht

Engl.: How are you feeling at this moment during the listening test?

Very good, good, average, bad, very bad

2) **Was denken Sie/ denkst du, wie gut haben Sie/ hast du die Aufgabe gelöst?**

Sehr gut, gut, mittelmäßig, schlecht, sehr schlecht

Engl.: How well do you think you solved the task?

Very good, good, average, bad, very bad

3) **Wie anstrengend war es für Sie/ dich, diese Aufgabe zu bearbeiten?**

Gar nicht anstrengend, wenig anstrengend, mittelmäßig anstrengend, eher anstrengend, sehr anstrengend

Engl.: How effortful was it for you to do this task?

Not at all effortful, little effortful, moderately effortful, rather effortful, very effortful

The questionnaire was tested with 35 children aged six to ten, 17 first to second-graders (mean age 6.47 years, 58.82% female) and 18 third- to fourth-graders (mean age 8.56 years, 27.78% female) and 25 young adults (mean age 26 years, 28% female) for five different classroom noise scenarios in combination with a listening experiment.

Results and Conclusion

Questions were answered on a five-point Likert scale. Each response was assigned a numerical value ranging from 0 (e.g. ‘very good’) to 4 (e.g. ‘very bad’). To provide an overall subjective listening effort score, the scores from all three questions were summed for each noise condition and participant, resulting in a continuous scale ranging from 0 (indicating no effort) to 12 (indicating maximum effort). Questionnaire scores were analysed using a two-factor ANOVA with noise block as the within-subjects variable and age as the between-subjects variable. The results are reported in detail in the corresponding publication by Seitz et al. (2024)[2].

To summarise, a child-friendly questionnaire was developed in this study to measure listening effort in children and adults. The results demonstrated the internal consistency of the questionnaire and its ability to differentiate subjective listening effort across noise conditions for both children and adults.

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Literatur

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