

Phonak Insight

Junior mode

The latest developments in Phonak Target™ Junior mode: everything you need for a truly optimized pediatric fitting.

Junior mode within Phonak Target™ is an evidence-based, customizable pediatric fitting mode which aims to make pediatric fittings more accurate and efficient. Drawing upon new research and feedback from the market, the Junior mode features in Phonak Target™ 3.2 have been expanded and optimized.

The purpose of this Phonak Insight is to review the rationale behind the development of Junior mode and describe in detail the new enhancements included in Phonak Target™ 3.2. These include: improvements in Junior mode defaults across all age ranges, a new age range (9–12 years), a tamperproof reminder for young children, a one-click set-up of DSL and NAL defaults, age-dependent acoustic parameters and a new Verification Assistant that streamlines the verification and target matching process in four simple steps for both Real Ear Measures (REM) and test box verification systems.

Why is a special fitting mode required for children?

Children's listening needs are very different from those of adults. Research suggests that children process sounds differently from adults. Children with normal hearing perform more poorly than adults with normal hearing on many auditory tasks. This puts them at a significant disadvantage in many listening environments. For example, children need higher signal-to-noise ratios (Hall, Grose, Buss and Dev, 2002), lower reverberation times (Neuman et al, 2010) and are less able to make use of contextual information (Nitttrouer and Boothroyd, 1990). Children are also exposed to diverse, often noisier, listening environments making it critical for them to have consistent access to all sounds. Therefore, unlike adults who already have language to fill in their understanding gaps, children need access to the sounds of life to build that foundation of language.

Compared to children with normal thresholds, hearing-impaired children are at an even greater disadvantage. They need a highly accurate hearing instrument fitting to provide them with the most consistent access to sounds possible and regular follow up to be as successful as possible. In addition, young children are also unable to give feedback to their hearing care professionals about their hearing instruments, yet they rely heavily on these devices to develop age-appropriate speech and language. Therefore pediatric fittings require a holistic, multi-disciplinary approach in order to address these needs.

With the introduction of newborn hearing screening and rapid advances in technology, the opportunity for improved long term outcomes for hearing-impaired children has increased dramatically. Several studies indicate that early diagnosis and intervention which includes the use of high quality, dedicated pediatric solutions fit with pediatric-friendly software, provides more positive outcomes for hearing-impaired children and their families (e.g. Robinshaw, 1995, Apuzzo and Yoshinaga-Itano, 1995 & Yoshinaga-Itano et al, 1998).

The needs of hearing-impaired children also vary widely depending on their age. For example, the requirements of a 6 month old infant will differ vastly from those of a pre-school or school-aged child, and contrast even more with those of a teenager. For this reason, Junior mode now offers four age ranges: 0-3 years, 4-8 years, 9-12 years, and 13-18 years and offers guidance to other questions hearing care professionals consider when fitting hearing instruments to children.

For example:

- Which features should be activated and which should be disabled?
- How many programs should the child have and be able to access?
- When should directional microphones be introduced?
- How should hearing instrument programming change as the child grows?

These questions can be challenging for both new and experienced pediatric hearing care professionals. The hearing instrument technology, including features, programs and manual controls, must be matched to the needs of the child and their family. Junior mode was developed to help answer these questions by providing efficient and tailored pediatric fittings, while taking into account the latest research and developments.

A short history of Junior mode

Phonak Target™ Junior mode is a pediatric fitting configuration based on the age of the child. Its aim is to enable both experienced and inexperienced pediatric hearing care professionals to perform accurate and efficient fittings. Junior mode was first launched in iPG in 2006, having been developed with input from the Phonak Pediatric Advisory Board, pediatric experts in the field, and peer-reviewed research.

Junior mode provides:

- Evidence-based, customizable pediatric defaults tailored for infants and toddlers (0-3 years), pre-school and school-aged (4-8 years), pre-teen (9-12 years), and teens (13-18 years).

- Printable, tailored reports for parents, caregivers, teachers and children.

The purpose of these reports is to empower families and children by providing individualized information about the child's hearing loss, hearing instrument settings, and in-depth information on a wide range of relevant topics.

- A holistic approach, taking into account the changing needs of children as they grow.

Why provide an evidence-based approach?

The need for evidence-based practice has grown over the past decade (McCreery, 2008). However, McCreery states that sometimes there is limited availability of research evidence. This is often due to the differences between hearing-impaired children who use hearing instruments and the fast pace of technological development.

Dollaghan (2007) points out that evidence-based practice should encompass not only external resources, such as peer-reviewed research published in respected journals, but should also be based on the clinician's experience and expertise, and the preferences of an informed parent or family member.

The importance of customizable Junior mode defaults

Junior mode uses an evidence-based approach to configure the features, program options and prescription formulae that are important for children. Below is a quick overview of the new pediatric defaults available in Junior mode. However, because there is no one "right" way, all of the Junior mode defaults are customizable.

There are also several pediatric fitting topics on which expert opinion differs. One example is the question of when to use

directional microphones with children. During the development of Junior mode, this was one of several topics that were reviewed and discussed with experts to provide the evidence behind these defaults. Please see the *Phonak Focus 39* for an in-depth discussion of the evidence behind the development of Junior mode. In addition, evidence on the benefits of current hearing instrument technology can be found at www.phonakpro.com/evidence.

Junior mode default overview

Program structure	0–3 years	4–8 years	9–12 years	13–18 years
Start up	Junior Roger/FM+M	Junior Roger/FM+M	Junior Roger/FM+M	Junior Roger/FM+M
SoundFlow	Disabled	Disabled	Enabled	Enabled
Program 1	Acoustic phone-DuoPhone	Speech in Noise-UltraZoom	N/A	StereoZoom
Program 2	N/A	N/A	N/A	N/A
Push button	Disabled	Disabled	Enabled	Enabled
EasyPhone	Disabled	Enabled-DuoPhone	Enabled-DuoPhone	Enabled-DuoPhone
Volume control	Disabled	Disabled	Enabled	Enabled

Updated Junior mode features

As part of the evolution of Junior mode, Phonak has continued to incorporate feedback from focus groups and pediatric audiologists around the world in order to build into Junior mode exciting new pediatric features. These include:

Verification Assistant

The manner in which output responses are displayed and variables used for calculating targets are not always consistent across commercially available verification systems. In addition, the variety of signal processing schemes, gain and compression, frequency lowering, and noise management algorithms in hearing instruments impacts the verification of hearing instrument settings. As a result, the displayed output results may not always be an accurate representation of true hearing instrument function, leading to misinterpretation and/or unnecessary fine tuning.

To address these challenges, Phonak Target™ 3.2 introduces a new Verification Assistant, which simplifies and streamlines the verification process. Verification Assistant is available as a default

when using Junior mode or it can be enabled in Phonak Target™ set-up menu. In line with how hearing instruments are verified today, the curves are based upon modulated speech input and displayed in either 2 cc or Real Ear views based upon whether test box or real ear measures are being performed.



Verification Assistant in fine tuning.

Verification Assistant consists of four simple steps that allow a user to crosscheck all of the variables that impact prescriptive target matching, such as venting, RECD values etc. All adaptive features are turned off and SoundRecover is deactivated by default in accordance with the University of Western Ontario (UWO) verification protocol for frequency lowering devices. For step-by-step instructions on how to use Verification Assistant, please see the Phonak Target™ Comprehensive Pediatric Fitting Guide.

Age-related acoustic parameters

In pediatric fittings, there are often challenges associated with the physical size of a child's ear canal and the high gain needs of prescriptive algorithms. Therefore, the Junior mode defaults for acoustic parameters for ages 0-3 years are standard tube, hook and 'occluded', independent of hearing loss.

Tamperproof reminder

Safety is an important part of hearing instrument use by young children. A new IEC standard 60601-2-66 has been implemented globally, stating that for children between the ages of 0-3 years, a tamperproof solution must be attached. The standard states that a 10 Newton force is required to open the battery door, or else it must be opened with a tool. This standard also applies to the removal of loose parts such as ear hooks. When hearing instruments are connected for the first time to the software, Phonak Target™ now provides a reminder to attach a tamperproof solution for 0-3 years.

DSL & NAL recommended defaults

When fitting pediatrics, there are two main fitting rationales that are used across the world: Desired Sensation Level (DSL) and National Acoustics Laboratory (NAL). A new feature in Junior mode is the ability to use either DSL or NAL defaults. The default for Junior mode is the DSL rationale. However, a file with recommended NAL defaults can be downloaded, making it easy for hearing care professionals to set-up the fitting rationale they prefer.

Start-up program: Junior Roger/FM+M

Junior mode's start-up program is now Junior Roger/FM+M by default, providing the hearing instrument supports direct audio input (DAI). Previously, it was known as Junior FM+M. However, with the introduction of Roger, Junior FM+M was changed to Junior Roger/FM+M to include this new cutting edge technology. The Junior Roger/FM+M program does not allow for microphone attenuation as this reduces the awareness of surrounding sounds through the hearing instrument microphones and poses safety concerns in locations such as playgrounds and near roads.

Traditionally, remote microphone technology (transmitter and receivers) known as FM systems were associated most strongly with educational use. However, with the development of Roger's new flexible wireless microphones, the Roger Clip-On Mic and Roger Pen, children can now benefit from such technology in a number of other situations, such as at daycare, at home, and during outdoor activities – improving access well beyond the classroom (Gabbard, 2005). For older children and teens, the new Roger Pen makes it easier to talk on a cell phone via Bluetooth, to listen to MP3 players, and communicate more effectively across a broad range of important social activities.

Hearing better in noise

As children get older, they often find themselves in noisier and more complex listening environments, in which automatic switching from omnidirectional to directional microphones can have a significant advantage (Ricketts, 2010). For example, when directional microphones are used with the speaker in front, there can be a signal-to-noise advantage of up to 3 dB, resulting in improvements in speech recognition in noise (Ching et al, 2008; Ricketts et al, 2005 & 2007; McCreery et al., 2012). Therefore, Junior mode now defaults to UltraZoom in the Speech in Noise program. For children between 4-8 years, UltraZoom is set-up as a manual program and can be accessed via a push button, while children of 9-12 and 13-18 years can access UltraZoom via automatic switching in SoundFlow.

Binaural VoiceStream Technology™

Due to the unique listening needs of children who are most effected by degraded acoustic conditions, the Junior mode defaults now offer all of the benefits of binaural hearing via Binaural VoiceStream Technology™. These unique Phonak advantages, such as binaural loudness summation, spatial release from masking, and overcoming the head shadow effect, are achieved through a wireless network of four microphones. Please see the Phonak Insight: 'Listening with two ears instead of one' for additional details about the benefits of binaural listening and Binaural VoiceStream Technology™. Binaural VoiceStream Technology™ features include:

DuoPhone

Access to the phone is an important developmental aspect of social communication for children (Palmer & Mormer, 1999). Therefore a binaural acoustic phone program called DuoPhone is available as a default across all age ranges. How this is accessed however differs: for 0-3 years, DuoPhone is only accessible via the push button or via remote control. For the other three age ranges, DuoPhone is set-up as an automatic phone program via EasyPhone. This set up was recommended due to the changing listening needs of children in the 0-3 year age range. While a 6 month old may not use a phone at all, an 18 month old may start to use this form of communication.

auto StereoZoom / StereoZoom

Adaptive directional microphones such as UltraZoom have traditionally been successful at improving speech understanding in moderate levels of noise. They help to narrow the focus by trying to reduce noise from the sides and back. However, the signal to noise ratios provided by directional microphones in higher noise

levels are just not enough. StereoZoom is the only technology capable of narrowing the focus further, via a binaural network of four microphones. This leads to a significant 2.5 dB improvement in SNR above adaptive directional microphones which translates to an additional improvement in speech intelligibility of up to 45%.

auto StereoZoom is the automatic activation of StereoZoom and available as part of SoundFlow. This means that as the noise level increases and there is speech present, the hearing instruments will automatically switch from UltraZoom to StereoZoom. Available only in premium hearing instruments, auto StereoZoom is part of SoundFlow between 9-12 & 13-18 years. If auto StereoZoom is not available, a manual StereoZoom program will be added in Advanced level products to the program structure for 13-18 years, as young adults can better manage when to use this program to hear better in noise.

Speech in Wind

Communicating in windy conditions can be extremely challenging. Therefore, because children tend to spend a significant amount of time outside – such as when playing outdoors – increasing access to speech by addressing the interfering wind can have a huge impact on social communication. One way to address this challenge is via a manual program called Speech in Wind. Reviewed by the Phonak Pediatric Advisory Board as being beneficial by making speech more available in windy environments, this feature can be added to the program structure of a child's hearing instrument. As long as a child can manage a push button, this feature can be used with children as young as 4 years old.

Conclusions

Since it was introduced in 2006, Junior mode has been continuously expanded and optimized to make pediatric fittings more accurate and efficient. These updates draw upon new research as well as feedback from the Phonak Advisory Board, clinicians and their families and now include the benefits of Binaural VoiceStream

Technology™ across a wide range of ages. As new clinical research emerges, we look forward to being able to offer these developments in future versions of Junior mode to further maximize the outcomes for hearing-impaired children.

Further information

www.phonakpro.com/evidence is a comprehensive listing all of the current research available on Phonak hearing instrument technology. It also includes a host of Focus articles, Phonak Insights, Field Study News editions and Compendiums on various hearing-related topics.

The resources referenced in this document are listed below:
Phonak Focus 39: Latest developments in fitting software for children
Phonak Insight: Listening with two ears instead of one
Phonak Insight: Binaural VoiceStream Technology™

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