

New software 'hearing dummies' pave the way for tailor-made hearing aids

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New software 'hearing dummies' are part of cutting-edge research that promises to revolutionise the diagnosis and treatment of hearing impairments.

The work could also be used in the long-term to develop a radical new type of hearing aid that can be customised using the hearing dummy to meet the different needs of individual patients. If the procedures gain clinical acceptance, a device could reach the market within 4 years.

The research is being carried out by a team at the University of Essex with funding from the Engineering and Physical Sciences Research Council (EPSRC).

The aim has been to enable [hearing aids](#) to be carefully calibrated so that they address the particular underlying hearing condition affecting each individual patient; and to ensure that they tackle the most common problem affecting hearing-impaired people – sound interference, which leads to an inability to follow conversations in noisy environments.

People also differ in how much they are affected by noisy environments, which is why developing a tailor-made approach represents such a significant breakthrough.

"Today's hearing aids don't help to separate sounds – they just amplify them," says Professor Ray Meddis, of the University's Department of Psychology, who has led the work. "So they often make everything too

noisy for the wearer, especially in social situations like parties, and some wearers still can't make out what people are saying to them. They find the whole experience so uncomfortable that they end up taking their hearing aids out! This discourages them from going to social occasions or busy environments and may result in them withdrawing from society."

The first key advance has been the development of unique computer models (or 'hearing dummies') that can use the information collected during the tests to simulate the precise details of an individual patient's hearing.

By altering individual mathematical algorithms within the computer models, the dummy's hearing capabilities can be adjusted until they perfectly match the hearing characteristics of the patient (e.g. where there is damage to different parts of the ear). This will then indicate the likely cause of the patient's hearing impairment.

"In the same way that a tailor's dummy is used to measure and fit a garment for a particular person, our software dummy is used to gauge a patient's hearing requirements so that their hearing aid can then be programmed to suit their needs right at the beginning of the process without the need to come back for further time consuming adjustments to their device".

The second key advance achieved by Professor Meddis and his team has been in the design of new hearing tests. Current clinical practice focuses on 'threshold testing' to identify how quiet a sound can be while remaining audible, and hearing aids are generally prescribed solely on the basis of these tests.

The new tests, which are quicker and easier to use, concentrate on higher sound levels more typical of everyday life.

"Our work has shown that, when it comes to hearing impairment, no two people are alike," says Professor Meddis. "That's why two people with apparently similar hearing thresholds often react very differently to their hearing aids."

The third advance involves the early stages of developing a new kind of hearing aid that simulates how a normal ear works. The aim of this new aid is to restore the particular aspects of hearing that are faulty and to do this as naturally as possible.

In collaboration with hearing aid manufacturer Phonak, Professor Meddis and his team have now designed a lab-scale version of such a device which is already being tested on patients. The next step is to work with a manufacturer to fine-tune the software and then miniaturise the technology so that the device can be reduced to conventional hearing aid scale.

"Traditionally, the fitting of hearing aids has focused on symptoms, not causes," Professor Meddis comments. "Our aim has been to break through the limitations of current hearing aids and current hearing assessment procedures, and so ultimately enable hearing impaired people to play a much fuller role in society."

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