



The impact of improved classroom acoustics on autistic students

Research findings and classroom applications

EXECUTIVE SUMMARY

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The Cooperative Research Centre for Living with Autism (Autism CRC)

The Cooperative Research Centre for Living with Autism (Autism CRC) is the world's first national, cooperative research effort focused on autism. Taking a whole-of-life approach to autism focusing on diagnosis, education and adult life, Autism CRC researchers are working with end-users to provide evidence-based outcomes which can be translated into practical solutions for governments, service providers, education and health professionals, families and people on the autism spectrum.

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Executive Summary

This report presents the results of *Project 2.028RS The Impact of improved classroom acoustics on autistic students* from *Program 2: School Years - Enhancing Learning and Teaching* within *The Cooperative Research Centre for Living with Autism (Autism CRC)*.

Overall, the results of Project 2.028RS support the trialling sound field amplification (SFA) in classrooms for students on the autism spectrum. By making it easier for students to hear the teacher, SFA put students in a better position to learn but did not guarantee students would go on to learn in the short-term. The benefits of SFA were realised with no observed risks for students on the spectrum.

Autism Spectrum Disorders (ASD) is the collective term for a group of neurodevelopmental disorders characterised by persistent deficits in social communication and social interaction, and by repetitive patterns of behaviour and restricted interests (Whitehouse, Evans, Eapen, & Wray, 2018). Students on the autism spectrum can have difficulties with auditory, speech and language processing, although the nature of these difficulties is complex. Most primary schools in Australia include students on the spectrum (Australian Advisory Board on Autism Spectrum Disorders, 2010) with support for these students mandated by Government policies for inclusive education. One such support could be sound field amplification (SFA), which has the teacher wear a microphone so that her voice can be distributed via a loudspeaker to the whole classroom.

The first study in Project 2.028RS used a systematic review of the scientific literature to conclude that improving classroom acoustics could help improve classroom performance in students on the spectrum.

The second study in Project 2.028RS used a single group, cross-sectional analysis of the acoustics in 33 classrooms in primary schools in and around Brisbane, Australia. It concluded that the “acoustic health” of these classrooms was generally poor and these classrooms could benefit from trialling SFA.

Studies three and four in Project 2.028RS used a two-group, randomised controlled trial with crossover to determine if SFA supported students on the spectrum in primary school classrooms in Brisbane, Australia.

Study three used standardized measures to show that short-term use of SFA in classrooms could assist students on the spectrum to improve their skills in some areas of phonological

processing (blending nonwords) in quiet and noise, but not in other areas of phonological processing (nonword repetition) in quiet and noise or in areas of attention, memory, literacy or numeracy.

Study four used functional measures in the form of teacher and student questionnaires and video assessment to show that short-term SFA in classrooms supported some functional listening behaviours for students including those on the spectrum. The supported behaviours included focusing on verbal instructions, attending to directions, staying on task, answering questions, attending to verbal instruction when noise is present, and rate of comprehension. The unsupported behaviours included student self-advocacy, awareness of distracting or non-distracting sounds, self-reported ability to hear the teacher, and response time to teacher instructions and questions.

At the time of this report, the products from *Project 2.028RS* included five papers in the peer-reviewed scientific literature (two published and three submitted), 13 papers at scientific conferences (seven presented, three submitted, and three to be submitted), and four translational works (three completed and one in preparation) for Autism CRC's inclusionEd a professional development platform and community of practice for educators working with students with diverse learning needs, including autism. Implications for Research and Practice

Implications for research

The findings of *Project 2.028RS* support ongoing research into the potential benefits of improving classroom acoustics for children on the autism spectrum. To date, this research has focused on the use of remote microphone hearing aids (RMHAs) with initial reports suggesting RMHA (Rance et al., 2017; Rance et al., 2014; Schafer et al., 2013; Schafer et al., 2016) may be more beneficial than SFA (Rance et al., 2017; this report) for some children on the spectrum. Limitations such as the potential for RMHAs to aggravate tactile sensitivities in some children on the spectrum (Rance et al., 2017; Rance et al., 2014) supports the need for ongoing research into alternative methods of improving classroom acoustics such as SFA and classroom acoustic modification. To better determine the benefits or not of classroom SFA for children on the spectrum, future research should consider longer-term use of SFA, greater use of functional outcome measures, investigation of a wider range of children on the spectrum, and the use of case studies to expand on the

small but promising body of research into the use of classroom SFA for children on the spectrum.

Implications for practice

The findings of *Project 2.028RS* show SFA has sufficient potential for improving classroom performance in children with ASD to warrant trialling in classrooms on a case-by-case basis. Realistic expectations of the potential benefits of SFA for children on the spectrum are needed with it being reasonable to expect that short-term SFA could benefit children on the spectrum in some areas of phonological processing and functional listening abilities, but not all areas phonological processing and functional listening abilities and not attention, memory, literacy or numeracy. This suggests SFA could put children on the spectrum in a better position to learn but does not guarantee those children will go on to immediately improve their learning (after McArthur et al., 2008). The absence in *Project 2.028RS* of any overtly negative effects of SFA suggests the potential for SFA to harm children on the spectrum in the classroom is low.

Key Recommendations

The trialling of SFA in classrooms is warranted

The trialling on a case-by-case basis of SFA in classrooms with children on the autism spectrum is warranted. Realistic expectations of the potential benefits of SFA for children on the spectrum are needed with SFA potentially putting children in a better position to learn but not guaranteeing they will go on to immediately improve their learning. SFA also offers a low risk of harm for children on the spectrum

Further research into classroom acoustics for children on the spectrum

The potential for any improvement in classroom acoustics to benefit children on the spectrum in the classroom warrants further research. Continued investigation into all means of improving classroom acoustics is recommended, including SFA, RMHAs and classroom acoustic modification.



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