Promoting generalization and maintenance in augmentative and alternative communication: a meta-analysis of 20 years of effectiveness research

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Authors' objectives
To determine the effectiveness of interventions in augmentative and alternative communication (ACC) with particular emphasis on strategies that induce generalisation and/or maintenance.

Searching
Databases were searched including the Educational Resources Information Centre (ERIC), PsycLIT, Psychological Abstracts, and Dissertation Abstracts International, using ‘appropriate natural-language terms’, controlled-vocabulary terms and journal names. Forty-six journals were handsearched between 1976 and 1995, as well as the reports ‘AAC Theses and Dissertations’ and ‘Master's and Doctoral Theses Update’. Footnote chasing was used as a third technique, and the reference lists of retrieved articles were also checked.

Study selection
Study designs of evaluations included in the review
Single-subject experimental designs which used a time-series format with graphically displayed data. Group experiments were excluded.

Specific interventions included in the review
The training of ACC (defined as an ‘area of clinical practice that attempts to compensate for the impairment and disability patterns of persons with severe expressive communication disorders’), serving a communicative function such as requesting.

The following prompt intervention strategies were included: mand/model; least to most intrusive; time delay; most to least intrusive; stimulus fading; graduated guidance; response shaping/ successive approximation; and other or combination.

Experiments using match-to-sample procedures, discrimination, memory aids, recipe cards, and schedule boxes were excluded, as were interventions focusing on motor compliance and natural speech development (unless secondary to primary dependent measure of ACC). Communication-based approaches to challenging behaviours were also excluded.

Participants included in the review
Persons (adults and children) with severe expressive communication disorders. The following classifications were included: mental retardation (mild/moderate); mental retardation (severe/profound); multiple disabilities; physical disability; autism; mental retardation; and autism (other/combination).

Persons whose only disability was due to a hearing impairment were not included.

Outcomes assessed in the review
Behaviour change, generalisation and maintenance.

How were decisions on the relevance of primary studies made?
The second author and a trained expert in single-subject research and ACC evaluated each article independently of each other to determine whether an article should be included. Differences were reconciled through discussion. Agreement for inclusion was also determined between the second author and an independent rater.

Assessment of study quality
The authors used predefined ‘rigid’ quality indicators (see Other Publication of Related Interest no.1) in order to assess
study quality. The criteria addressed issues relating to study design, inter-observer agreement, procedural integrity, and availability of data to calculate the PND/POD (percentage of nonoverlapping data/percentage of overlapping data). The authors do not state how the papers were assessed for quality, or how many of the reviewers performed the quality assessment.

**Data extraction**

The second author and a trained research assistant independently extracted and coded the studies. Inter-rater agreement for 32 data series was 100% for all variables except PND intervention (91%).

Coding categories were as follows: study number; subject number; age; classification; intervention target; and prompt intervention strategy.

Each experimental phase was coded as follows: setting; instructional; ACC system; intervention design; generalisation design; maintenance design; generalisation and maintenance strategies; generalisation dimensions; procedural integrity data; procedural integrity in percent; inter-observer agreement; inter-observer agreement in percent; baseline characteristics; and PND intervention (IPND), PND generalisation using intervention baseline as comparison (GPND-IB), PND generalisation using generalisation baseline as a comparison (GPND-GB), POD maintenance using the intervention phase as a comparison (MPOD), and PND maintenance using the intervention baseline as a comparison (MPND).

**Methods of synthesis**

How were the studies combined?

The percentage of nonoverlapping data (PND) (requires the calculation of nonoverlap between baseline and successive intervention phases) (see Other Publications of Related Interest no.2) was used to combine studies of intervention effectiveness, generalisation effectiveness and maintenance effectiveness.

To integrate studies in terms of maintenance effectiveness, the percentage of overlapping data (POD) was also used by calculating the percentage of maintenance data points within or above the last three intervention data points.

How were differences between studies investigated?

Studies were grouped in the following categories: intervention; generalisation; and maintenance.

**Results of the review**

Fifty studies, involving 232 data series, were included.

Inter-observer agreement was 100% for inclusion of studies.

Fifty single-subject experimental studies, including 232 comparisons of experimental phases, reported quantitative outcome measures. Interventions were effective in terms of behaviour change, generalisation, and, to a lesser degree, maintenance.

Using predefined quality indicators to arrive at a best evidence data set (57 intervention studies, 7 generalisation studies and 1 maintenance study met all of the requirements), interventions remained effective in changing behaviour, whereas generalisation and maintenance data could not be interpreted due to the small number of studies.

**Authors’ conclusions**

This synthesis indicates that ACC interventions are effective in terms of behaviour change, generalisation, and, to a lesser degree, maintenance. This represents an important finding, considering these times of increased accountability and scarce resources. When predetermined quality indicators were applied to yield a more restricted data set, interventions remained effective in changing behaviour, whereas generalisation and maintenance data could not be interpreted due to the small n.
CRD commentary
The review addressed a well defined question and the literature search was very thorough. Study selection was performed independently by two or more authors, thereby reducing the risk of bias. Study quality was assessed but was not used in the final analysis as the authors decided that not enough generalisation and maintenance data met the criteria. Details of individual studies pooled in this review were not presented in the text, only the bibliographic information is listed in an appendix. The statistical methods were well described and seem to be appropriate for calculating the effect sizes of single-subject data. The authors also discuss the limitations of the method they chose to use (% non-overlapping data). It is not clear whether pooling of all the different interventions was appropriate or not. Also, participants ranged from 5 years to over 25 years and had a range of disabilities.

Overall, this was a fairly good review and the authors' conclusions appear to follow on from the results.

Implications of the review for practice and research
Practice: The authors state that the lack of sufficient evidence data along with the prominence of "train and hope" approaches calls for training of clinical researchers and clinicians in the breadth of available strategies and training as to how these strategies may be incorporated into treatment procedures.

Research: The authors state that more care needs to be taken in selecting appropriate designs for evaluating generalisation and maintenance effectiveness while considering the range of available strategies for promoting generalisation and maintenance.

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Bibliographic details

Other publications of related interest

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract
contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.