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Intervention for mixed receptive–expressive language impairment: a review

JAMES BOYLE¹ | ELSPETH MCCARTNEY² | ANNE O'HARE³ | JAMES LAW⁴

¹ Department of Psychology, University of Strathclyde, UK. ² Division of Speech and Language Therapy, Department of Educational and Professional Studies, University of Strathclyde, UK. ³ Department of Reproductive and Developmental Medicine, University of Edinburgh, UK. ⁴ Department of Speech and Language Pathology, Newcastle University, Newcastle Upon Tyne, UK.

Correspondence to Professor James Boyle at Department of Psychology, University of Strathclyde, 40 George Street, Glasgow G1 1QE, UK. E-mail: j.boyle@strath.ac.uk

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LIST OF ABBREVIATIONS

RCT Randomized controlled trial
RELI Receptive–expressive language impairment
SES Standardized effect size
SLI Specific language impairment
SLT Speech and language therapist

Studies indicate that language impairment that cannot be accounted for by factors such as below-average non-verbal ability, hearing impairment, behaviour or emotional problems, or neurological impairments affects some 6% of school-age children. Language impairment with a receptive language component, and problems in expressive language in particular, appears to be more resistant to intervention than specific expressive or phonological delays, and carries a greater risk of comorbid behavioural difficulties as well as adverse outcomes for language development and academic progress. This paper considers underlying explanations that may account for receptive–expressive language impairment. It also reviews evidence for the effectiveness of intervention from theory and recent systematic reviews, trials, and speech and language therapy practice.

Children with receptive–expressive language impairment (RELI), also referred to as ‘receptive language disorder’¹ or ‘mixed receptive–expressive disorder’,² form a subset of those with speech, language, and communication needs who commonly have problems understanding both spoken and written language; they have particular difficulties in comprehending vocabulary and grammar and inferring meaning. They will have problems with expressive language and some will also have difficulties in pragmatics, i.e. the use of language in social contexts.³

Population studies indicate that some 6% of 5-year-old children have significant difficulties in language functioning.^{4,5} However, variability is observed across studies in the stringency of criteria and the nature of the measures used to define language impairment.^{6,7} For example, composite scores are often used which do not distinguish between the child’s language production (expressive language skills) and understanding of language (receptive language skills). However, studies that do make this distinction indicate that 2 to 4% of 5-year-olds have RELI.^{5,8} A detailed study of referral rates in one primary care trust in the UK providing local community health services based on 1100 referrals to speech and language therapists (SLTs) over a 15-month period⁹ would suggest a UK prevalence of 4.5%, which is at the higher end of these estimates. Caution is required, however, as local factors such as staffing and resources for intervention would have influenced referral patterns.

RELI is likely to have a marked long-term impact on the outcomes for language development,^{10–12} literacy,^{10,12,13}

behaviour, and social development.^{12,14,15} There are links also to mental health problems.^{16,17} Studies consistently reveal that RELI is a higher risk factor for adverse long-term outcomes than specific ELI, which highlights the importance of effective early intervention.

Intervention for RELI may be informed by an understanding of levels of explanation based upon relevant theory and probable underlying mechanisms.¹⁸ We shall consider some of these as a precursor to considering specific approaches to treatment.

LINGUISTIC EXPLANATIONS

In general, children with RELI have particular difficulties with morphosyntax, i.e. with word inflections and the grammatical rules governing them.^{19,20} Characteristically, they have delays in understanding and applying the rules governing the correct combination of the elements of words, such as endings that mark verb tenses (e.g. *-ed*), third-person singular verbs (e.g. *I think, he thinks*) and plurals (e.g. *-s*), auxiliary verbs that denote tenses (e.g. *was running, is running*), and with determiners (*the, a*). Children with RELI also have deficits in correctly inferring meaning from what is said to them^{21,22} and in formulating questions.²³

Linguists have proposed theoretical explanations for these characteristic problems. One view is that such problems are specific to language, for example to linguistic modules of grammar/syntax^{24–26} or pragmatic competencies²⁷ and that they can be explained without reference to other, more general aspects of cognition. However, critics have expressed concern

1 about the extent to which linguistic theory can provide explanations of language impairment.²⁸ Cross-linguistic studies
2 have also cast further doubt on the extent to which some of
3 the explanations can be generalized to languages other than
4 English.²⁹

7 COGNITIVE PROCESSING EXPLANATIONS

8 Children with RELI may experience difficulties in managing
9 the cognitive functions of storage and processing where they
10 have to complete two cognitive operations under time pressure.
11 They also find it hard to learn new words or morphemes
12 when processing demands are high. Linguistic explanations
13 cannot readily account for these particular problems. This has
14 given rise to the view that limited general processing capacity
15 underpins the difficulties.^{30–32}

16 Children with RELI are also more likely to have slower
17 reaction times across a wide range of verbal and non-verbal
18 tasks than children with expressive problems only, and both
19 groups have slower reaction times than typically developing
20 peers, giving rise to a related view that their difficulties are due
21 to a slower rate of cognitive processing.^{18,33}

22 Attempts have also been made to locate the underlying
23 problems that many children with RELI experience in
24 retaining verbal and non-verbal information at the level of
25 working memory,³⁴ both in terms of phonological working
26 memory deficits^{35–37} and executive functions, such as response
27 inhibition.³⁸

28 Finally, children with RELI are commonly observed to have
29 auditory processing deficits, both at the level of frequency discrimination^{39–41}
30 and in rapid auditory processing.^{40–42} Tallal
31 et al. refer to the latter perceptual processing deficits as ‘temporal
32 processing difficulties’, which is in line with their
33 hypothesis that basic temporal integration processes are
34 important for the neural representations for units of speech
35 and processing non-verbal tones. Within this account, children
36 with RELI are held to process auditory information at a
37 slower rate than their typically developing peers. They are
38 thus disadvantaged when discriminating, sequencing, and
39 remembering dynamic temporally cued components that are
40 brief in duration or rapid in succession, such as speech formant
41 transitions (e.g. separated by short inter-stimulus intervals,
42 usually in the range of tens of milliseconds), and they require
43 longer processing times than typically developing peers.⁴²

45 GENETIC FACTORS

46 Studies of twins indicate that genetic influences play an important
47 part in RELI as well as in disorders of language acquisition
48 in general.^{43–45} Genome scan studies specifically looking
49 for linkage to specific language impairment (SLI) have either
50 used categorical phenotypes, such as whether an individual
51 had a diagnosis of speech and language impairment,⁴⁶ or have
52 used quantitative measures of language ability.⁴⁷ The only
53 linkage study that has specifically included families of probands
54 with a strict phenotype of RELI (‘receptive language disorder’
55 according to research criteria of the ICDH-10⁵) replicated
56 linkage to 16q and 19q.⁴⁸ This linkage was seen with
57 the non-word repetition test as a measure of phonological

What this paper adds

- Receptive–expressive language impairment persists over time.
- There is a dearth of evidence from systematic reviews and randomized controlled trials for approaches to effective treatment.
- Expressive language interventions in children show promise and should be further investigated by phase II exploratory trials.

working memory and not with the expressive language score as had been seen in the SLI Consortium, 2002 genome scan study. Non-word repetition also gives the best discrimination between parents of affected children and non-affected families.⁴⁹ However, the relationships between the phenotypic markers, the genotype, and the clinical condition of SLI are complex. Although non-word repetition deficits can behave as a marker in individuals whose earlier language difficulties resolved and be present among wider family members affected by RELI,⁴⁵ they are not in themselves sufficient to give rise to SLI. Five-year-olds who have weak phonological working memory skills can also be found in typical populations without having SLI.⁵⁰ Thus there appear to be additive risk factors such as syntactic deficits and/or auditory temporal deficits; the evidence suggests that the former are heritable and the latter environmentally determined.⁴³

COMMENTS

One feature common to these competing theoretical accounts is that in general they have arisen from the study of within-child variables in experimental cohorts varying in selection criteria¹⁸ with little in the way of exploration of proximal and distal external variables. There may also be overlap between the accounts. For example, RELI may have a high heritability because it represents the most severe form of SLI and has a genotype that has an impact on correlated cognitive processes that mediate linguistic processing.

INTERVENTIONS FOR RELI

Evidence from systematic reviews

Recent systematic reviews of the literature report evidence of the effectiveness of speech and language therapy interventions for expressive language outcomes for children with SLI that cannot be accounted for by low IQ, behaviour or emotional problems, hearing or neurological impairments.^{3,51} However, the picture for receptive language outcomes is more problematic owing to a dearth of evidence, particularly from randomized controlled trials (RCTs), the effects of early remission,⁴ lower incidence of RELI relative to specific expressive language delay, and variability in the criteria for eligibility for recruitment.

Law et al. in an early review⁵¹ identified only five studies with receptive language outcomes that met the eligibility criteria of controlled studies of effects of intervention upon children in the age range 0 to 7 years with ‘primary’ speech and language delay (akin to SLI but not based upon formal psychometric discrepancy criteria). Four of these studies involved children aged 36 months or younger. This raises issues about the reliability of the test scores because measures obtained from preschool children are particularly susceptible to the influence of factors associated with development, such as short

1 attention span and distractability, levels of activity, and prob-
2 lems in engaging with an unfamiliar test administrator.⁵² In
3 addition, few of the participants in these studies had RELI,
4 with receptive language outcomes reported for children
5 receiving intervention for specific expressive language delay. It
6 is thus unclear whether these interventions would be beneficial
7 for children with RELI.

8 In Law et al.'s more recent review,³ only two studies met
9 inclusion criteria for interventions targeted on receptive lan-
10 guage (here, receptive syntax) with 'no treatment' control
11 groups, both reporting non-significant effects. In the first of
12 these studies Glogowska et al.⁵³ reported a non-significant
13 standardized effect size (SES) of 0.19 (95% CI -0.12 to 0.51)
14 from a sample of 155 preschool children (71 receiving treat-
15 ment and 84 controls). In the second study, Law et al.⁵⁴
16 reported a non-significant SES of -0.45 (95% CI -1.18 to
17 0.28) from a sample of 38 preschool children (28 treatment
18 and 10 controls).

20 Evidence from recent randomized control trials

21 Evidence from four recent large-scale RCTs not thus far
22 included in published systematic reviews report interventions
23 for children with RELI. Three of these studies investigated
24 interventions based upon underlying auditory processing defi-
25 cits. The fourth was based upon existing models of language
26 therapy in the UK.

27 Cohen et al.⁵⁵ reported the findings from a multicentre,
28 intention-to-treat RCT performed in Scotland with blind
29 assessment of outcomes to determine the effectiveness of the
30 Fast ForWord®-Language program.⁵⁶ This is a computer-
31 based intervention that utilises auditory processing theory³⁹
32 and uses games with signal-processed modified speech
33 designed to compensate for underlying auditory temporal pro-
34 cessing difficulties. The participants ($n=77$) were aged between
35 6 and 10 years, were monolingual English speakers with had a
36 diagnosis of RELI. All had scores for both receptive and
37 expressive language on the Clinical Evaluation of Language
38 Fundamentals (CELF-3^{UK}),⁵⁷ a standardized language test, of
39 an average of -2SDs below the mean. The children were
40 randomized into one of three groups: a group receiving Fast
41 ForWord®-Language, a comparison group receiving ongoing
42 language therapy, and a second comparison group who played
43 educational computer games with unmodified speech. Out-
44 comes were measured at 9 weeks' post-baseline assessment
45 and at 6 months' follow-up by qualified SLTs not otherwise
46 involved in the project who were blind to the children's
47 research group. The results revealed no significant additional
48 benefit from playing the Fast ForWord®-Language games
49 5 days a week for 6 weeks under parental supervision for
50 90 minutes each day relative to the first control group (SES
51 -0.04 [95% CI -0.59 to 0.52] for receptive language) nor rela-
52 tive to the computer-games control group, who played com-
53 mercially available educational computer games without
54 modified speech on the same schedule. This trial did not
55 support auditory processing deficits as a general explanation
56 of severe RELI, although this was a particularly impaired
57 cohort of children.

A recent large-scale RCT performed in the USA⁵⁸ also
investigated the effectiveness of Fast ForWord-Language.
Participants included children with RELI but their progress
could not be distinguished among children with specific ELI.

Bishop et al.⁵⁹ addressed issues relating to both auditory
temporal processing and to limited general processing capacity
explanations of RELI in an RCT involving 36 participants
aged 8 to 13 years. The children had scores of less than -1SD
on standard measures of language. Participants with RELI
failed to benefit from a computer training program for com-
prehension of grammatical constructions to help sentence
comprehension (SES 0.04 [95% CI -0.2 to 0.28]). The find-
ings once again fail to support auditory processing deficits as a
general explanation of RELI within the range of their study.
They would, however, be compatible with a general limited
processing capacity explanation and suggest that a more
individualized, contextualized approach may be preferable
for children with RELI, in contrast to the computer-based
rote-learning approach used on the study.

Boyle et al.^{60,61} investigated the effectiveness of current lan-
guage-therapy practices based upon meta-analyses of pub-
lished studies.^{51,62} The participants in their RCT were 161
children aged 6 to 12 years who had persistent primary recep-
tive and/or expressive language impairment with no reported
marked hearing loss and no moderate/severe articulation/
phonology/dysfluency problems or who otherwise required
individual SLT work. Eighty-six of the children had RELI
(defined using a threshold criterion of CELF-3^{UK} Receptive
Language⁶⁰ $SS_{\leq 81}$ and non-verbal IQ scores of >75) and 75
had specific expressive impairment. They were randomized to
one of five conditions, which were as follows: (1) Individual,
direct project therapy: SLT working individually with a child
($n=34$, 20 with RELI); (2) Group direct, project therapy: SLT
working with a small group of children ($n=31$, 17 with RELI);
(3) Individual, indirect project therapy: a trained SLT Assis-
tant working individually with a child ($n=33$, 17 with RELI);
(4) Group, indirect project therapy: a trained SLT Assistant
working with a small group of children ($n=32$, 18 with RELI);
and (5) Control group (who received existing community-
based services; $n=31$, 14 with RELI).

Project therapy was delivered three times per week for
15 weeks, in 30 to 40 minute sessions, and those in the com-
parison group received their ongoing therapy regime. The
therapy focused on comprehension monitoring, vocabulary
development, grammar, narrative, and developing language
learning strategies. All post-baseline measures were blind-
assessed by qualified SLTs not otherwise involved with the
project.

There was no significant difference between the four modes
of project therapy but children with specific expressive impair-
ment made greater gains in both receptive and expressive
language than those with RELI (all p values <0.025). Further,
although the children receiving project therapy made signifi-
cant overall gains in expressive language ($p=0.031$), there was
only a modest and non-significant intervention effect for
receptive language scores relative to the comparison group for
the subgroup of children with RELI (SES 0.25 [95% CI

1 -0.32 to 0.82]). However, the impact of the small numbers
2 involved on the statistical power of this comparison (14 in the
3 comparison group and 72 receiving project therapy) should be
4 noted.

5 Recent phase I and small-scale trials including children with
6 established RELI also suggest vocabulary development as a
7 promising intervention. Direct teaching of vocabulary was
8 effective with four children aged 10 to 11 years (Easton
9 et al.⁶³) and two children aged 8 to 9 years using criterion-
10 referenced measures,⁶⁴ and as effective as narrative interven-
11 tion in developing language skills with a cohort of 54
12 secondary school children with RELI.⁶⁵ 'Traditional' therapy
13 including vocabulary teaching was as effective at encouraging
14 eight children over 8 years old with severe RELI to use a men-
15 tal visualization strategy to aid their comprehension of oral
16 narratives.⁶⁶ Interestingly, mental imagery training itself pro-
17 duced a significant improvement in the responses of children
18 with RELI to literal questions about a short narrative.⁶⁶ Fur-
19 thermore, a small-scale RCT found that developing semantic
20 definitions of verbs was as effective as syntactic-semantic
21 shape coding on criterion-referenced measures of verb argu-
22 ment structure for 27 children aged 11 to 16 years with severe
23 RELI attending a specialist residential school.⁶⁷

24 In the case of young preschool children, Camarata et al.⁶⁸
25 found that a treatment group of 21 children with an mean age
26 of 31 months with RELI made significantly greater gains in
27 receptive language in response to an intervention focused on
28 expressive grammar than a randomly allocated comparison
29 group of six children (mean age 37.6mo) ($p < 0.05$, SES 1.07).
30 The intervention consisted of twice-weekly individual sessions
31 of an hour for 12 weeks using imitation, modelling, and con-
32 versational re-casting approaches targeted on improving
33 production of grammar. Further investigation of such transfer
34 effects with young children would be of interest, although it
35 should be noted that the eligibility criteria of 1SD below
36 expected levels on standardized measures of both expressive
37 and receptive language would have resulted in the recruitment
38 of some children with less severe levels of impairment. It is
39 also unclear to what extent these problems are likely to persist
40 over time.

41 **Mapping practice onto theory**

42 The extent to which professional practice with children with
43 RELI maps on to underlying theory has been investigated in a
44 recent survey of qualified SLTs in the UK, focusing on prac-
45 tice with children aged 5 to 11 years.⁶⁹ The findings revealed
46 that children with RELI are seen as a priority and receive
47 extensive services that reflect diverse practice. This includes
48 interventions targeted on specific deficits or based upon pub-
49 lished programmes/frameworks for practice, behavioural
50 approaches to teaching vocabulary, and sentence comprehen-
51 sion. Meta-cognitive activities (e.g. training to think about
52 communication) were widely used, in particular with older
53 children: nearly 80% of all activities reported with those aged
54 11 years compared with some 20% of reported activities for
55 those aged 5 years. Underlying theory did not appear to be
56 regarded as important for informing intervention, and SLTs

placed more emphasis on the presenting problems associated
with the child's deficit. This begs the question of the use of
current theory for informing interventions and of the effec-
tiveness of disseminating research findings to practitioners.
However, the low number of respondents ($n=56$) should be
noted.

DISCUSSION

There are relatively few published controlled intervention
studies (most of which are based on monolingual English-
speaking populations) and an overall lack of evidence for
approaches to effective treatment for children with RELI.
Given that auditory processing interventions, and regimes
based upon intensive delivery of existing therapy in particular,
have not thus far proved very effective, there is a case for inves-
tigating the use of further approaches. There are two comple-
mentary directions for such research. Phase II exploratory
trials⁷⁰ to determine the feasibility of promising impairment-
based interventions, for example therapy regimes for vocabu-
lary development,⁷¹⁻⁷⁴ and 'transfer' effects between expressive
language intervention and receptive language gains in the case
of young children with RELI, are needed to guide future
full-scale RCTs, which are difficult to resource and populate.
In addition, given the persistent nature of RELI, there is a
pressing need to investigate 'enabling' interventions; i.e.
interventions that support children in coping with RELI and
maximize academic attainment.

The intractable nature of RELI also suggests that interven-
tions that help children cope with ongoing receptive difficul-
ties will be needed, to ensure that the children have the
opportunity to experience facilitating communication environ-
ments and learn coping strategies, as the linguistic demands of
literacy, education, and work increase.⁷⁵ This will mean that
functional communication goals and interventions aimed at
increasing participation will be needed over extended periods
of time.

Many children with reading comprehension failure have
comorbid difficulties in oral language comprehension,⁷⁶ but
these may go unrecognized in schools because they may have
no overt problems in speech, phonological processing, or word
reading accuracy.⁷⁷ Investigating and identifying RELI among
children with educational failure affords an opportunity for
appropriately tailored literacy materials and instruction, as well
as reciprocal teaching.⁷⁸ Advice and guidance can encourage
classroom and official talk that is sensitive to linguistic process-
ing limits and welcomes requests from the children for clarifi-
cation when they do not understand. Children can also be
encouraged to develop the executive and self-regulation skills
used in planning, goal setting, monitoring, and completing
tasks, applying working memory, sustaining attention, and
inhibiting impulses,⁷⁹ and to manage their emotional states⁸⁰
in order to aid learning and understand what is socially accept-
able in their school and adult communities.

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