Meta-analysis of physiological outcomes of hospital-based infant intervention programs

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Authors' objectives
To determine the overall effectiveness of stimulation programmes designed to enhance physiological development, on infants of different mean birth weights. To examine whether variables related to study design, or characteristics of the infants studied, affected the results.

Searching
CINAHL, Index Medicus/MEDLINE, Dissertation Abstracts, ERIC and Psychological Abstracts were searched using the following key descriptors: ‘interventions’, ‘tactile’, ‘auditory’, ‘visual’, ‘kinesthetic’, ‘vestibular’, ‘gustatory’ and ‘stimulation’. Bibliographies were handsearched. Unpublished studies were not sought, or included in the review.

Study selection
Study designs of evaluations included in the review
Group one (11 studies): 3 interrupted time series experiments with removed treatments, 2 cohort without treatment partitioning, and 6 as an untreated control group with pre-test and post-test. Random assignment to groups was used in 7 of these studies only.

Group two (26 studies): 18 randomised controlled trials, 4 interrupted time series and 4 with non-equivalent control group.

Specific interventions included in the review
Various stimulation techniques: kinaesthetic vestibular, environmental alteration, gustatory, tactile, multimodal (all senses), auditory, and education of mother.

Participants included in the review
Premature infants (gestation less than 37 weeks) were included.

Outcomes assessed in the review
The outcomes assessed were weight gain, motor processes coordination, cardiopulmonary stability, sleep state, energy retention expenditure and feeding development.

How were decisions on the relevance of primary studies made?
The author does not state how the papers were selected for review, or how many of the reviewers performed the selection.

Assessment of study quality
To be included in the meta-analysis, studies had to include stimulation programmes developed for premature infants (post-1979), the programmes’ effectiveness on physiological outcomes, and data that permitted calculation of an effect size. The percentage agreement between coders was established on 3 occasions. Firstly at 6 months, and secondly in a search of alternate years, beginning with 1980, in Index Medicus and CINAHL; 95% agreement was achieved. Thirty-nine studies were selected for inclusion in the review, of which 10 were assessed for percentage agreement between coders on study characteristics and study quality; 86 and 92% agreement was achieved respectively.

Data extraction
The data were extracted using a coding form. For each study substantive and methodologic characteristics where recorded including: source; year of publication; professional discipline of first author; sample size; type of stimulation or intervention; mode, timing and pattern of intervention; outcome measures and effect size. The overall quality of
individual studies was also recorded using the Quality of Study instrument developed by Smith (see Other Publications of Related Interest). This instrument has a scoring range from 1 (low quality) to 5 (high quality).

Methods of synthesis

How were the studies combined?
The studies were combined by a meta-analysis (standardised mean difference).

How were differences between studies investigated?
A homogeneity test was performed to evaluate the likelihood that the 39 study outcomes were heterogeneous and sampled from different populations of study outcomes. Mean combined effect sizes for the 39 studies were found to be heterogeneous. Disjoint cluster analysis calculated that 2 studies were outliers but not within the same cluster; these were eliminated from further analysis. Two clusters of studies were subsequently found and analysed separately.

Results of the review

Of the 210 studies originally identified, only 39 were included in the review.

Group 1 (11 studies) met the test of homogeneity.

Mean birth weight was 1,260 g (standard deviation, SD = 357.81). Mean effect size was 1.54 (SD = 0.54; 95% confidence interval, CI: 1.22, 1.86). Infants were offered an average of 606.4 minutes of stimulation in a 24-hour period (SD = 614.8). Physiological development of premature infants was enhanced from 20 to 80%. Mean quality of study was 3.7 (SD = 0.39).

Group 2 (26 studies) met the test of Homogeneity.

Mean birth weight was 1,524 g (SD = 343.28). Mean combined effect size was 0.51 (SD = 0.30; 95% CI: 0.39, 0.63). Infants were offered an average of 403.5 minutes of stimulation in a 24-hour period (SD = 572.83). Total length of time the treatment was continued at home ranged from 2 to 24 months (median = 12). Physiological development of premature infants was enhanced from 38 to 62%.

Authors' conclusions

There is a strong link between hospital-based infant stimulation programmes and physiological development of premature infants. This study supports the initiation of a programme of stimulation within the neonatal intensive care unit, although the exact nature of the programme that would provide the greatest benefits remains unclear.

CRD commentary

Some of the methodological and study details are unclear. The follow-up period varies widely from 2 to 24 months, and no details of the duration of the interventions are given. Thus, the period over which measurements were made is unclear. The exclusion of the two outlying studies may lead to bias in the results, and is questionable.

Bibliographic details


PubMedID
8183653

Other publications of related interest

Indexing Status
Subject indexing assigned by NLM

MeSH
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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.