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[Intervention Review]

Day care for pre-school children

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ABSTRACT

Background

The debate about how, where and by whom young children should be looked after is one which has occupied much social policy and media attention in recent years. Mothers undertake most of the care of young children. Internationally, out-of-home day-care provision ranges widely. These different levels of provision are not simply a response to different levels of demand for day-care, but reflect cultural and economic interests concerning the welfare of children, the need to promote mothers' participation in paid work, and the importance of socialising children into society's values. At a time when a decline in family values is held responsible for a range of social problems, the day-care debate has a special prominence.

Objectives

To quantify the effects of out-of-home day-care for preschool children on educational, health and welfare outcomes for children and their families.

Search methods

Randomised controlled trials of day-care for pre-school children were identified using electronic databases, hand searches of relevant literature, and contact with authors.

Selection criteria

Studies were included in the review if the intervention involved the provision of non-parental day care for children under 5 years of age, and the evaluation design was that of a randomised or quasi-randomised controlled trial.

Data collection and analysis

A total of eight trials were identified after examining 920 abstracts and 19 books. The trials were assessed for methodological quality.

Main results

Day-care increases children's IQ, and has beneficial effects on behavioural development and school achievement. Long-term follow up demonstrates increased employment, lower teenage pregnancy rates, higher socio-economic status and decreased criminal behaviour. There are positive effects on mothers' education, employment and interaction with children. Effects on fathers have not been examined. Few studies look at a range of outcomes spanning the health, education and welfare domains. Most of the trials combined non-parental day-care with some element of parent training or education (mostly targeted at mothers); they did not disentangle the possible effects of these two interventions. The trials had other significant methodological weaknesses, pointing to the importance of improving on study design in this field. All the trials were carried out in the USA.

Authors' conclusions

Day care has beneficial effect on children's development, school success and adult life patterns. To date, all randomised trials have been conducted among disadvantaged populations in the USA. The extent to which the results are generaliseable to other cultures and socioeconomic groups has yet to be evaluated.

PLAIN LANGUAGE SUMMARY

Day care for pre-school children

Day care has beneficial effect on children's development, school success and adult life patterns. However, to date, all randomised trials have been conducted among disadvantaged populations in the USA. The extent to which the results are generaliseable to other cultures and socioeconomic groups has not yet been established.

BACKGROUND

The debate about how, where and by whom young children should be looked after is one which has occupied much social policy and media attention in recent years. Mothers undertake most of the care of young children. Internationally, out-of-home day-care provision ranges widely, from 2% of under threes in Britain to 48% in Denmark (Meltzer 1994). These different levels of provision are not simply a response to different levels of demand for day-care, but reflect cultural and economic interests concerning the welfare of children, the need to promote mothers' participation in paid work, and the importance of socialising children into society's values, (Kamerman 1993). In Europe and North America there is greater consensus about the value of day-care for children over three than there is for children under three years. As regards the latter group, ideas about the necessity of psychological attachment to, and care by, mothers continue to hold considerable sway in some social contexts (Bowlby 1951, Ainsworth 1969, Belsky 1988, Sroufe 1990).

At a time when a decline in family values is held responsible for a range of social problems, the day-care debate has a special prominence. A second significant strand here is the argument that contemporary strains on families rebound on both the quantity and quality of parenting; more children are raised by lone parents, and more parenting fails to meet children's needs. An important policy response has been the rise of parenting programmes, which offer a variety of packages of support, education, counselling and training, (Pugh et al [Pugh 1994]). These are mainly targeted at families considered to be 'at risk', and mothers are the main recipients of attention. On the basis of a rhetoric of effectiveness, some of these programmes are attracting significant amounts of statutory and voluntary funding in the UK, but few have been systematically evaluated in a study currently in progress [Oakley & Rajan]).

In the health care field, debates about effective and appropriate interventions are increasingly settled by referring to the evidence-base of randomised controlled trials, the 'gold standard' evaluation method (Chalmers 1995). However, the approach is controversial in the field of social interventions (Oakley 1996). There is a substantial body of evidence indicating that, as with health care, less rigorous evaluation methods tend to yield biased estimates of intervention effects, (Campbell 1975; Gough 1993; Logan 1972; Oakley 1996; Schulz et al 1995). As a consequence, the wrong conclusions may be drawn about an intervention and its effects.

OBJECTIVES

A systematic review was conducted to assess the effects of day-care on children and families.

METHODS

Criteria for considering studies for this review

Types of studies

Trials were eligible for inclusion in the review if the assignment of study participants to the intervention or control group was random or quasi-random (for example, alternate record numbers). There were no language restrictions.

Types of participants

Children under five.

Types of interventions

Non parental day-care for pre-school education.

Types of outcome measures

Educational: IQ or developmental quotient; measures of school success, including the need for special educational classes and retention in grade; competence in reading, writing, mathematics and general knowledge; self, parent, and teacher reported behavioural measures; self-esteem and career aspirations; mother-child interaction.
Health and welfare: hospital admissions, injuries, infections, otitis media, speech and language development. Long term outcomes including teenage pregnancy, employment, marriage, criminal behaviour, welfare assistance.
Maternal effects: maternal employment, education and family income.

Search methods for identification of studies

Seven electronic databases were searched: MEDLINE, EMBASE, the Cochrane Controlled Trials Register, the Social Science Citation Index, PsycLIT, Eric and BIRD (French language database). For the MEDLINE and EMBASE searches, the Cochrane optimally sensitive search strategy for randomised controlled trials (Dickersin et al 1994) was used in conjunction with the terms 'child day-care centres', 'school-nurseries', 'infant-premature', 'infant-low birth weight', 'education', 'child development', 'early intervention' and 'family day care'. The Cochrane Controlled Trials Register was searched using the terms 'day-care', 'nursery school' and 'child development'. For the searches of the social science databases, key terms were constructed using published indexes from these databases. Two journals were searched by hand from 1977 to 1996: Child Development, and The Journal of Child Abuse and Neglect. The references to all relevant papers identified were searched, as were bibliographies of books, trial reports, review articles, (Benasich 1992, Farran 1990, Ramey 1982 and 1985 [see secondary references associated with both Brooks-Gunn, 1994 and Campbell 1994] as well as Seitz 1990, Zigler 1985) and conference proceedings. The authors of all eligible studies were contacted, as were two authors well-known in this area of research; they were asked to identify any trials not listed in the bibliography produced by the electronic and hand-searches. Authors of eligible studies were also asked to provide further information on study methodology, outcomes not already reported, and any long-term follow up data that might have become available.

Data collection and analysis

Identified trials were assessed for methodological quality using the criteria developed by Prendeville et al (Prendeville 1998). This method provides an assessment of the extent to which bias may have affected the study results. Trials are scored on 3 dimensions: 1) whether those enrolling the study participants could know which treatment was next in line, (knowing can result in experimental and control groups that are not equivalent on socio- demographic and other characteristics); 2) whether the primary analysis was based on all cases randomly allocated, (where this is not the case and significant attrition has occurred conclusions based on a subsample may be biased); 3) whether assessment of the outcome may have been affected by knowledge of treatment allocation. On each criterion, a maximum score of three indicates methodological strength. The following outcomes were defined in advance and searched for in all studies: changes in developmental and/or intelligence quotients, school performance and attitude, children's behaviour, children's health, maternal employment, fertility and interaction with children. Other reported outcomes were also included.

RESULTS

Description of studies

The MEDLINE search yielded 453 abstracts, of which 19 were included in the review. The figures for EMBASE were 211 and 2. The Cochrane database provided 50 references, one of which had not already been identified. No new studies were found using the social science databases (a large number of observational studies had to be searched through, because the key terms do not allow trials to be separated out). Neither hand-searching nor author-contacts yielded any new studies, although two authors gave useful follow up and new outcome data. Searching the bibliographies of books and references generated a further 20 abstracts which provided information for the review. Altogether 920 abstracts or papers and 19 books were examined. A total of eight trials of non-parental day-care were found. Many of these had resulted in multiple publications.
All of the studies were conducted in the USA. In total 2203 children were randomised to receive day care or be in a control group. Three studies had over 300 participants, three had under 100. None of the children were older than four at the start of the intervention; in four studies, the intervention started when children were under one, and in one of these, at birth. Length of follow up ranged from six months to 27 years. The longest follow-up was for the Perry Pre-School Project; the Carolina Abecedarian Project had a 15 year follow-up. In the Milwaukee Project the seven year follow-up data were supplemented by 11 year follow up data for certain educational outcomes.

Most of the studies targeted families of lower socio-economic status; only two also included middle-class families. All except one study targeted children of African American origin only. Boys and girls were included except for one study which only targeted boys. Nearly all the studies mixed an element of out-of-home day-care with some home visiting and targeted parental training. Only three studies did not include an element of home visits. Some studies had a specific intervention group of home visits which was evaluated as a comparison group; others tried to involve families as part of a centre-based day-care intervention. Some studies offered a different intervention to control group families: play activity, social work services and/or formula milk, health services, or payment to parents.

The studies varied greatly in the intensity of intervention. Duration of day-care ranged from two hours a week for eight months to seven hours per day, five days per week for five years. Some studies had specific curricula for their programmes; others did not. All the projects were explicitly concerned with the attainment of basic cognitive concepts, and many of the programmes emphasised linguistic development. The ratio of teachers to children was not less than 1:6 for older children and 1:1 for infants. As regards outcomes for the children, all the studies looked at cognitive development, six at school performance and attitude, four at behaviour, and one at health outcomes. Four studies collected and reported data on maternal employment, and two on subsequent childbearing. Five studies also included data on mother-child interaction.

Risk of bias in included studies

Seven of the eight trials were randomised controlled trials. The Milwaukee study was a quasi-randomised prospective controlled trial. A month was randomised as treatment or control month and several children born that month were allocated to groups accordingly. There was a deviation from randomisation procedure in the Perry Pre-School Program, as five children changed group status from intervention to control because of maternal employment.

While all eight studies stated that random allocation was used to allocate participants to intervention and control groups, only three studies described the randomisation process. Only one study used what has been shown to be the most valid method of allocation concealment, namely, central randomisation using a computer-generated sequence. The authors of seven studies were asked to give more details about the randomisation process; two replied. There were no studies where the primary analysis of the principal outcome was based on all participants as randomised. Attrition ranged from 3% to 81%, and in one study, (Deutsch 1974, Institute for Developmental Studies [see Deutsch 1966]), it was unbalanced between experimental and control groups. Four studies took steps to ensure that the outcome assessment was made blind to whether or not the participants were in the experimental or control groups. Three studies did not have blind outcome assessment although in two of these longer term follow up was done by researchers from Consortium for Longitudinal Studies who had better blinding of the observers than the original researchers. Nevertheless, even they could have some possibility of bias, particularly at the interview stage.

Effects of interventions

Developmental and educational effects of day care

Several different methods of assessing intelligence and development were used, partly because of the different age groups. All the studies showed that IQ was increased by participation in day-care, although there was no pre-test measure for Minimal Intervention study. The appropriate numerical values for IQ (means and standard deviations) at aged three years were reported in four studies. The weighted mean difference in IQ between children attending day-care and controls was 14.4 (95%CI 12.3 to 16.4). The appropriate numerical values for IQ at aged five years were reported in two studies. The weighted mean difference in IQ was 8.0 (95%CI 5.8 to 10.2). Although home visits were provided to one group of children in project CARE, to enhance their cognitive gains, this was not associated with increased IQ. Results from multiple regression analysis showed that the involvement of fathers in Infant Health and Development Program was associated with better cognitive outcome, (Yogman 1995 [see Brooks-Gunn, 1994]). The 'IQ effect' appeared to decrease a year or two after the end of intervention in most studies, but the early cognitive gain was associated with later prevention of school failure. The Perry Pre-School Programme, showed an IQ difference of 13 points following a year of intervention; there was a difference of five points two years after the end of the intervention at age seven; at 14 there was no IQ difference, but many experimental-control group differences in the area of school achievement favoured the experimental group.

Measures of school achievement used included placement in special education classes, being kept down in the same class for a second year, children's own evaluation of their school performance, and a range of tests of competence in reading, writing, mathematics and general knowledge. This information was available for six studies. All except one of the studies which included these measures showed a persistent difference favouring the experimental group. For the five studies that provided the proportions of the intervention and control groups who were retained in grade, the odds ratio for grade retention was 0.47 (95%CI 0.30 to 0.72). For the four studies that provided the proportions of the intervention and control groups who received special education classes, the odds ratio for special education was 0.29 (95%CI 0.17 to 0.49).

Behavioural and health effects of day-care

Three studies looked at the effect of day-care on children's behaviour. In the Perry Pre-School Project, pre-school education led to improved classroom and personal behaviour at 6-9 years as rated by teachers. At ages 6-9, teachers judged the programme children as more motivated, and they themselves placed greater value on schooling when they were 15 years old, (Berruta-Clement et al,

1984). 'Chronic delinquent' behaviour was self-reported in 36% of experimental and 52% of control group children; 43% of the experimental group were non-offenders or had offended only once, compared with 25% in the control group. Long-term follow up at the age of 27 years showed that five times as many control group members had been arrested five or more times (7% versus 35%) and three times as many had been arrested for drug dealing (7% versus 25%), (Schweinhart 1993).

In the Milwaukee study the intervention children were more likely to show disruptive behaviour than controls. In the Abecedarian study, programme children were slightly more likely to be retained in special education classes for behavioural problems; follow up at eight years showed no experimental-control group differences on various psychological scales; these began to emerge at 12 and 15 years, when experimental group children rated themselves higher on self-concept than control children (Campbell and Ramey, 1994; Campbell, 1995; Campbell, 1996; Campbell and Ramey, 1995 [see Campbell 1994]). In the Infant Health and Development Program, maternal ratings of child behaviour showed higher scores for intervention children at three but not at five years (Spiker, 1993 [see references associated with Brooks-Gunn, 1994]). Researchers blind to subjects' status who rated videotapes of mother-child interaction at 30 months scored the intervention group higher on measures of persistence, positive involvement with task and enthusiasm.

The one study which included child health outcomes was the Infant Health and Development Program. The average number of reported health conditions was higher for the intervention group at age three years (an excess of 0.27 conditions per year), but not at five years; hospitalisation rates were similar, (McCormick, 1991 [see Brooks-Gunn, 1994]).

Effects of day care on mothers

In the Abecedarian Project, programme and control group mothers were comparable on education and employment pre-intervention, but programme mothers had on average one more year of education than controls when their children were 54 months old, fewer were unemployed or had unskilled jobs, and more were financially self-supporting, (Campbell et al, 1986[see references associated with Campbell 1994]). Mothers in the Milwaukee Project were more likely to have a stable employment history and a higher weekly income if their children were in the experimental group. The Perry Pre-school programme reported no significant difference in maternal employment as a function of intervention status. Mothers in the experimental group in the Infant Health and Development Programme had more employment than control mothers, and entered the work force when their children were younger. In the one study that looked at subsequent childbearing, Project Care, teenage programme mothers were less likely to have further children (23% versus 40%).

Four studies included mother-child interaction as an outcome. In the Abecedarian Project, videotaped sessions suggested that experimental infants communicated with their mothers at a higher level - they were four times more likely to try to modify their mothers' behaviour, and had longer periods of mutual play (Ramey et al, 1982 [see references associated with Campbell 1994]). Researchers in the Milwaukee project found increased mother-child reciprocal communication, as did those in the Infant Health and Development Program (Spiker, 1993 [see references associated with Brooks-Gunn, 1994]). In the Perry Pre-school Program, there were no differences on measures of 'closeness' and quality of relationships derived from interviewing parents and children at 15 years (Berruta-Clement et al, 1984).

Long term effects of day-care

Only the Perry Pre-School project collected data on long-term follow up. These data cover 123 (96%) of the 128 children originally recruited. The follow up results show that more of the experimental group held jobs at age 19 (50% versus 32%), and more were attending college or job-training programmes (38% versus 21%); fewer of the experimental group were in receipt of welfare assistance (18% versus 32%), had experienced teenage pregnancy (64 per 100 young women in the experimental group versus 117 per 100 for controls), or had been arrested for criminal acts (31% versus 51%). This difference was maintained at 27 years, when experimental group members had a higher rate of high school graduation (71% versus 54%), half as many arrests (2.3 versus 4.6), significantly higher earnings ($1219 versus $766 a month), were less likely to depend on welfare assistance (15% versus 32%) and more likely to be home-owners (36% versus 13%). Marriage rates were also higher, and single parent rates lower, for experimental group members.

DISCUSSION

Evidence from randomised trials indicates that out-of-home day-care has beneficial effects in important areas of children's well-being, particularly in enhancing cognitive development and preventing later school failure, which were the outcomes most commonly measured. It also appears that longer interventions are linked with more academic success, but it is unclear what the precise timing should be. The Perry Pre-school Project suggests that the chance of success is higher if the intervention starts at three rather than four years; the Abecedarian Project started at six months and continued until five years and had the best outcome. The Minimal Intervention project was the least intensive approach; it started at two years but has still shown a difference at the age of 16 years.

The studies included in the review also show that pre-school education has a beneficial effect on children's behaviour. This conclusion is significantly different from that derived from observational studies, which is that children in day-care show disturbed and difficult behaviour, (McGuire and Richman, 1988) or negative moods and aggressive behaviour, (Melhuish, Moss 1990). This difference highlights the importance of distinguishing well-

designed studies. The studies discussed in this paper also suggest a link between early behavioural differences and later behaviour. The long-term evidence from the Perry Pre-school Project showing reduced rates of criminal behaviour in experimental children is particularly compelling.

None of the trials looked at a range of educational, health and welfare outcomes for children. There is some evidence that children in day-care do have more minor illness than those cared for exclusively at home. Most researchers who have looked at maternal outcomes in terms of employment and education have found that centre-based day-care increases maternal employment and education, which in turn improves the socio-economic status of families, and is likely to mediate outcome for the children in terms of cognitive development and school success.

The results of the review in terms of mother-child interaction should be reassuring to those who may be concerned about the potentially damaging effects of day-care on attachment. There is evidence that children in day-care communicate better with their mothers than those not in day-care. This counters the argument of Belsky (Belsky 1988) amongst others, that day-care starting below one year is likely to be associated with unsecure-avoidant attachment of child to mother. Recent unpublished evidence in a large cohort study indicates that it is the quality of the mother-child relationship rather than placement in day-care that determines secure attachment, (NICHHD 1996).

Four trials were not included in this review: three trials of Parent-Child Development Centers, (Andrews et al 1982, Johnson, Walker 1987,1991) and a trial of a Parent Training Program, (Field et al 1982, Stone 1988) We omitted these because they all required mothers to attend with their children during the provision of day-care. It is, of course, a significant research question as to whether the effects of day-care are different according to whether or not mothers (or indeed fathers) are present. Interestingly, the results of these four studies suggest relatively small or no effects of such an approach involving mothers.

The review reported in this paper confirms others carried out in the field of social interventions, where finding methodologically sound studies has been described as akin to the metaphorical search for a needle in a haystack, (Oakley 1996). The filter of a systematic review reduces a large universe of studies to a small number of trials conducted with sufficient methodological rigour to make their results credible. The major methodological failings identified in this review were; 1) not evaluating the intervention of day-care at all; 2) using an observational or other non-experimental study design; and 3) (in the experimental studies) not taking steps to ensure that experimental and control groups are similar, a task which is best achieved by good randomisation with adequate allocation concealment. In their methodological study of treatment effects in controlled trials, Schulz et al. (Schulz et al 1995) showed that adequate allocation concealment is the most important criterion in ensuring the methodological quality of studies.

By including all eligible trials, systematic reviews aim to avoid biased ascertainment. However, bias may arise if relevant published or unpublished studies are missed. Although our search strategy was designed to minimise the number of missed studies, the possibility of biased ascertainment is open to question.

AUTHORS' CONCLUSIONS

Implications for practice

The evidence suggests that day-care has a positive effect on a number of important social outcomes for children and families. However, translating these findings into social policy is impeded by the dominant ideological perspective in countries such as Britain which see child care as the responsibility of mothers, and as belonging to the private domain. Other countries take a different view, (Sommer, 1992). For example, research effort in Nordic countries is devoted to answering questions about the optimal period of day-care attendance and further development in the quality of day-care. Its effectiveness and the need for day care is accepted.

Structural changes in the family and employment sectors mean that more children are being brought up in lone parent families, and an increasing proportion of mothers of young children are in the paid labour force (Haskey 1996; Ditch et al 1994). In Britain and the USA mothers and children living on their own are emerging as the social group most likely to live in poverty, (Judge, Benzeval 1993). Current debates about the increasing burden of welfare spending, declining family values, and rising rates of school failure and juvenile crime, highlight the importance of early intervention to avoid a range of adverse outcomes for both children and families, (Shepherd and Farrington [Shepherd 1995]; Yoshikawa 1994). Provision of out-of-home day-care is one such intervention. It is a routine part of educational provision in some countries. It is popular with mothers, and demand frequently exceeds supply. A 1990 survey carried out for the British Department of Health found that over 40% of mothers of three and four year olds not attending day nursery would like them to do so, (Meltzer 1994). The data drawn on in this review show the potential of day-care to increase maternal education and employment. Other analyses have shown that day-care may be significantly cost-effective in terms of increased maternal earnings (Joshi, Davies 1992).

Implications for research

All the studies included in this review were carried out in the USA. Most of them were targeted attempts to improve outcomes in socially disadvantaged populations, rather than efforts to evaluate the policy of providing day-care for children from different social backgrounds. No trials of day-care have been conducted in Britain,

where the discussion of day-care effects is dominated by an appeal to weak observational data. A pilot study for a trial of day-care is currently in progress, exploring parents' understanding of the need for this type of research and their willingness to take part in a trial, (Oakley and Roberts 1996). Well-designed research addressing questions of effectiveness is required. Such research needs to get away from the fragmentation of research questions and children's and adult's lives into the different domains of education, health and welfare.

As suggested above, there is also a need to separate out the effects of parent-training, parent-education or parent-support interventions from those attributable to day-care. The same provisos apply to the evaluation of parent-involvement interventions as to day-care. Many claims about the effectiveness of parent-involvement interventions are based on observational data only (Newpin 1993; Home-Start 1993), and may therefore offer biased estimates of their effects. It is important that any future trial of pre-school day-care should avoid the methodologic weaknesses of previous work identified in this review. Particular attention needs to be paid to generating comparable intervention and control groups and using valid procedures for allocation concealment. Steps also need to be taken to ensure minimal loss to follow up, adequate length of follow up to examine long-term educational and social outcomes, and blinding of outcome assessment. Future work needs to integrate information on both processes and outcomes, and collect both qualitative and quantitative data across a range of education, health and welfare outcomes (Oakley, 1992).

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Brooks-Gunn, 1994

Methods	Follow up = 2 years, excellent study design with low attrition and good blinding of observers
Participants	Babies born prematurely with different socio-economic bacground and ethnic groups, 985 participants randomised from birth
Interventions	Home visits in the first year twice a week; day care 1-3 years of age+ parental support Day care minimum 4 hours a day, 5 days per week for 2 years, non-compliance 14%
Outcomes	Developmental quotient and IQ, behavioural competence, health status, health care use, weight gain, maternal employment, public assistance and health insurance, mother-child interaction
Notes	Infant health and development program

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation concealment?	Low risk	A - Adequate

Campbell 1994

Methods	Follow up = 12-15 years , low attrition rate, excellent blinding of outcome observers
Participants	Age of entry= 6 weeks, disadvantaged families, 111 children randomised
Interventions	E= day care 8 hours a day for 5 years, social work services and infant formula; school based intervention up to 8 years of age for a proportion of children; home-school resource teacher when children entered school C= social work services and infant formula
Outcomes	IQ scores, school achievement, mother-child interaction, maternal employment and education, children's psychological well-being
Notes	Carolina Abecederian Project

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Allocation concealment?	Unclear risk	B - Unclear

Deutsch 1966

Methods	Follow up = 13 years, high attrition rate which is unbalanced between two groups, reasonable blinding of outcome assessors
Participants	Age of entry = 4 years; 504 participants randomised , all from disadvantaged families
Interventions	Centre based program with small groups of children with strong parent - community based program, emphasis on language development
Outcomes	school competence, developed abilities, children's attitude and impact on family
Notes	Institute for developmental studies

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Garber 1988

Methods	Quasi-randomised allocation of participants; Follow up = 7 years, low attrition, poor blinding of outcome observers
Participants	Age of entry = 3 months; 40 children randomised, very disadvantaged background, low maternal IQ
Interventions	Infant/early childhood stimulation and family/maternal rehabilitation; home visits for 4 months, small group centre-based training program afterwards for 6 years
Outcomes	Developmental quotient, IQ and school achievement; initial large differences in IQ but later follow up not showing any difference in school achievement
Notes	Milwaukee project

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	High risk	C - Inadequate

Gray 1970

Methods	Study duration = 12 years Low attrition rate, poor blinding of outcome assessors
Participants	Age of entry = 3 years, 65 participants randomised, all disadvantaged social backround
Interventions	E= 2-3 years summer school and home visits in winter C= 2x week play in the last summer

Gray 1970 (*Continued*)

Outcomes	IQ, measures of achievement and language - later FU school competence, developed abilities, children's attitude and impact on family
Notes	Parent training project significant changes in IQ and school achievemnt

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Palmer 1972

Methods	Follow up= 9 years, low attrition rate, inadequate blinding of observers
Participants	boys only, age 2 years, mixed socio-economic status, 310 participants
Interventions	One to one intervention in a centre, 2 hours a week for 8 months
Outcomes	IQ levels, language, various developmental outcomes, school competence, developed abilities, children's attitude, impact on family
Notes	Minimal Intervention significant impact on IQ and school achievement

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Schweinhart 1993

Methods	Length of follow up = 24 years, low atrition, good blinding of outcome observers
Participants	Age at entry = 3 years, 128 participants randomised, all disadvantaged children
Interventions	Centre based and home visits , 30 weeks a year, 12.5 hours a week in the centre, 1.5 hours a week at home , majority for 2 years
Outcomes	IQ change, special educational placement, grade retention, social development, parental satisfaction, educational aspiration and expectations, delinquent behaviour, employment, self confidence, relationship with parents

Schweinhart 1993 (*Continued*)

Notes	Perry Preschool Project very important study with good design and very long term follow up, showing impressive results

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Low risk	A - Adequate

Wasik , 1990

Methods	Follow up 6 months; low attrition rate and adequate blinding of observers
Participants	Age of entry=6 weeks ; disadvantaged families; 65 children randomised
Interventions	E1= day care = home visits; small groups of infants and children; E2: home visits and infant formula; C= infant formula
Outcomes	Developmental index and IQ, home environment, child rearing attitudes Home based intervention group did worse than control group
Notes	Project CARE

Risk of bias

Bias	Authors' judgement	Support for judgement
Allocation concealment?	Unclear risk	B - Unclear

Characteristics of ongoing studies *[ordered by study ID]*

Roberts

Trial name or title	Effect of out of home day care on the health and welfare of socially disadvantaged families with children: a randomised controlled trial
Methods	
Participants	
Interventions	Out of home day care
Outcomes	
Starting date	

Roberts (*Continued*)

Contact information	Roberts I, Oakley A
Notes	

DATA AND ANALYSES

Comparison 1. Day-care vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 IQ at 36 months of age	4	1109	Mean Difference (IV, Fixed, 95% CI)	14.37 [12.30, 16.44]
2 IQ at 5 years of age	2	495	Mean Difference (IV, Fixed, 95% CI)	8.02 [5.84, 10.20]
3 retention in grade	5	535	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.47 [0.30, 0.72]
4 special education classes	4	307	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.29 [0.17, 0.49]
5 5 or more arrests	1	123	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.18 [0.07, 0.43]
5.1 males	1	72	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.19 [0.07, 0.51]
5.2 females	1	51	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.12 [0.02, 0.94]
6 arrested for drug dealing	1	123	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.23 [0.08, 0.65]
6.1 males	1	72	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.25 [0.08, 0.76]
6.2 females	1	51	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.14 [0.01, 2.22]
7 earning more than $2,000 per month at age 27 - males	1	68	Peto Odds Ratio (Peto, Fixed, 95% CI)	8.89 [2.73, 28.92]
8 earning more than $1,000 per month at age 27 - females	1	47	Peto Odds Ratio (Peto, Fixed, 95% CI)	3.67 [1.11, 12.13]
9 home ownership at age 27	1	117	Peto Odds Ratio (Peto, Fixed, 95% CI)	4.41 [1.82, 10.72]
9.1 males	1	70	Peto Odds Ratio (Peto, Fixed, 95% CI)	3.90 [1.45, 10.45]
9.2 females	1	47	Peto Odds Ratio (Peto, Fixed, 95% CI)	7.47 [0.98, 56.97]
10 welfare benefits at age 27	1	113	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.30 [0.12, 0.71]
10.1 males	1	62	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.28 [0.06, 1.22]
10.2 females	1	51	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.31 [0.10, 0.91]
11 high school graduate	1	117	Peto Odds Ratio (Peto, Fixed, 95% CI)	2.10 [1.00, 4.42]
11.1 males	1	66	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.75 [0.28, 2.05]
11.2 females	1	51	Peto Odds Ratio (Peto, Fixed, 95% CI)	7.38 [2.45, 22.27]
12 married at age 27	1	119	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.99 [0.87, 4.55]
12.1 males	1	70	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.01 [0.35, 2.94]
12.2 females	1	49	Peto Odds Ratio (Peto, Fixed, 95% CI)	5.35 [1.47, 19.43]
13 placement for educable mental impairment	1	112	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.36 [0.15, 0.85]
13.1 males	1	66	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.52 [0.18, 1.52]
13.2 females	1	46	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.20 [0.05, 0.80]
14 births outside marriage - females	1	49	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.30 [0.10, 0.91]

Analysis 1.1. Comparison 1 Day-care vs control, Outcome 1 IQ at 36 months of age.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 1 IQ at 36 months of age

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Brooks-Gunn, 1994	347	93.5 (19.1)	561	84.5 (19.9)		63.4 %	9.00 [6.40, 11.60]
Campbell 1994	41	104 (13)	45	84 (14)		13.1 %	20.00 [14.29, 25.71]
Garber 1988	17	126 (9.38)	18	94 (10)		10.4 %	32.00 [25.58, 38.42]
Wasik , 1990	61	102 (12.5)	19	81.3 (10.6)		13.1 %	20.70 [14.99, 26.41]
Total (95% CI)	**466**		**643**			**100.0 %**	**14.37 [12.30, 16.44]**

Heterogeneity: Chi² = 53.84, df = 3 (P<0.00001); I² =94%

Test for overall effect: Z = 13.62 (P < 0.00001)

Test for subgroup differences: Not applicable

Analysis 1.2. Comparison 1 Day-care vs control, Outcome 2 IQ at 5 years of age.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

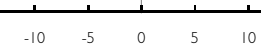
Outcome: 2 IQ at 5 years of age

Study or subgroup	Treatment N	Mean(SD)	Control N	Mean(SD)	Mean Difference IV,Fixed,95% CI	Weight	Mean Difference IV,Fixed,95% CI
Deutsch 1966	260	99.17 (11.3)	142	92.04 (12.35)		79.2 %	7.13 [4.68, 9.58]
Schweinhart 1993	44	94.9 (13)	49	83.5 (10.2)		20.8 %	11.40 [6.61, 16.19]
Total (95% CI)	**304**		**191**			**100.0 %**	**8.02 [5.84, 10.20]**

Heterogeneity: Chi² = 2.42, df = 1 (P = 0.12); I² =59%

Test for overall effect: Z = 7.20 (P < 0.00001)

Test for subgroup differences: Not applicable

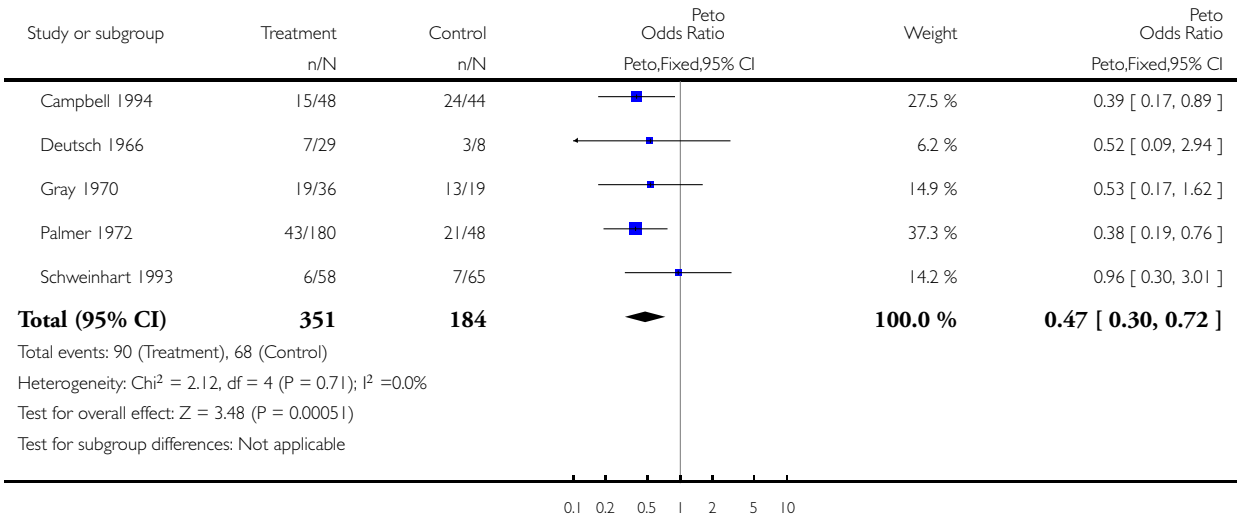


Analysis 1.3. Comparison 1 Day-care vs control, Outcome 3 retention in grade.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 3 retention in grade



Analysis 1.4. Comparison 1 Day-care vs control, Outcome 4 special education classes.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 4 special education classes

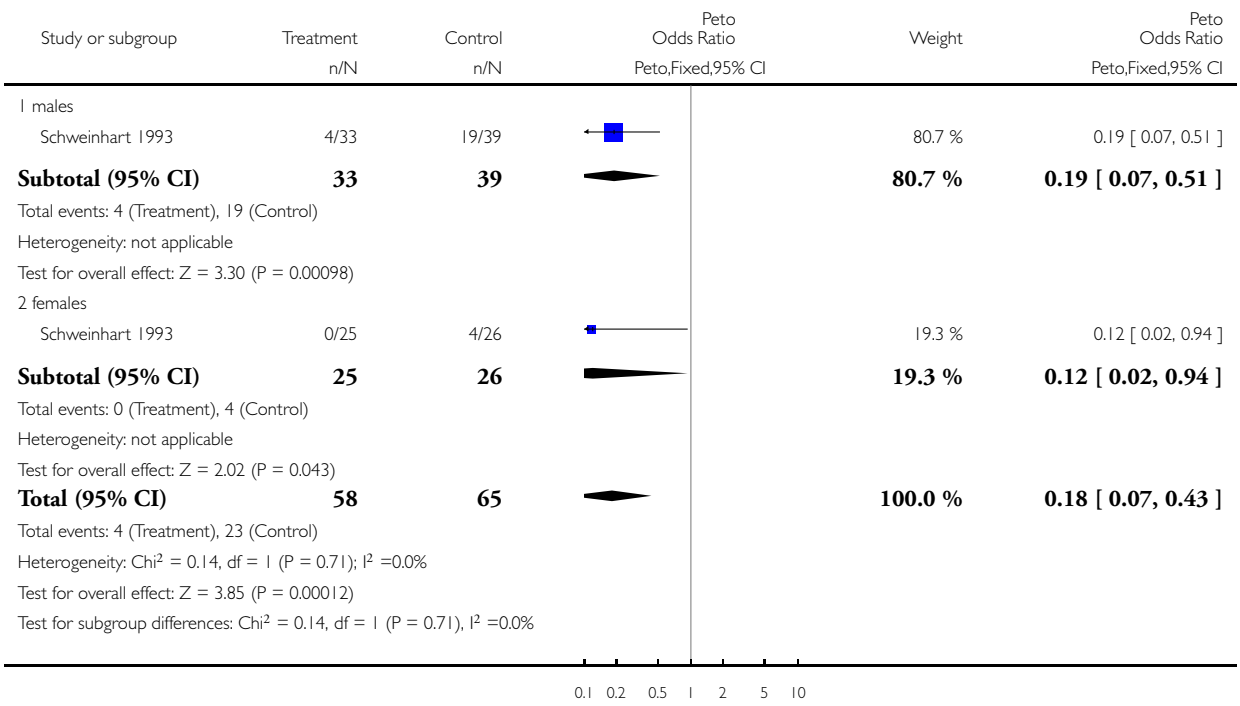
Study or subgroup	Treatment n/N	Control n/N	Peto Odds Ratio Peto,Fixed,95% CI	Weight	Peto Odds Ratio Peto,Fixed,95% CI
Campbell 1994	12/48	21/44		40.1 %	0.38 [0.16, 0.88]
Deutsch 1966	0/29	1/8		1.3 %	0.01 [0.00, 1.15]
Gray 1970	1/36	6/19		10.6 %	0.08 [0.02, 0.41]
Schweinhart 1993	10/58	26/65		48.1 %	0.34 [0.15, 0.73]
Total (95% CI)	**171**	**136**		**100.0 %**	**0.29 [0.17, 0.49]**
Total events: 23 (Treatment), 54 (Control)					
Heterogeneity: Chi^2 = 4.85, df = 3 (P = 0.18); I^2 =38%					
Test for overall effect: Z = 4.54 (P < 0.00001)					
Test for subgroup differences: Not applicable					

Analysis 1.5. Comparison 1 Day-care vs control, Outcome 5 5 or more arrests.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 5 5 or more arrests

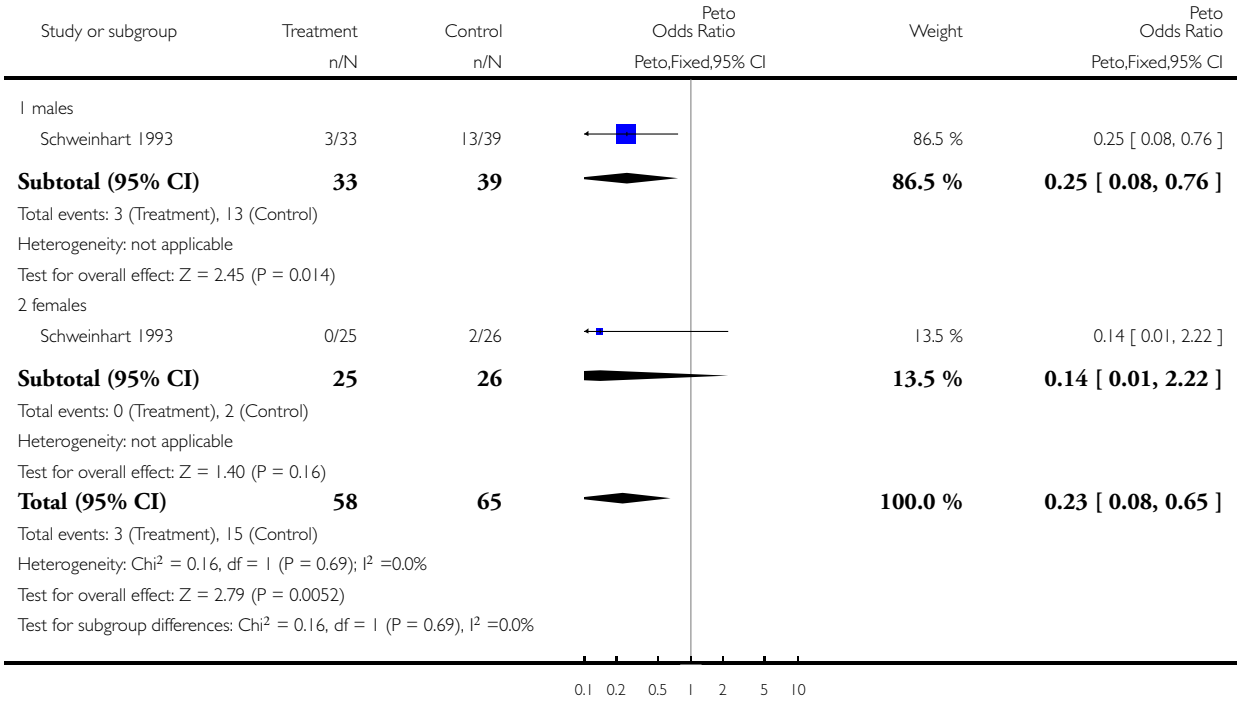


Analysis 1.6. Comparison 1 Day-care vs control, Outcome 6 arrested for drug dealing.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 6 arrested for drug dealing



Analysis 1.7. Comparison 1 Day-care vs control, Outcome 7 earning more than $2,000 per month at age 27 - males.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 7 earning more than $2,000 per month at age 27 - males

Study or subgroup	Treatment n/N	Control n/N	Peto Odds Ratio Peto,Fixed,95% CI	Weight	Peto Odds Ratio Peto,Fixed,95% CI
Schweinhart 1993	12/29	2/39		100.0 %	8.89 [2.73, 28.92]
Total (95% CI)	**29**	**39**		**100.0 %**	**8.89 [2.73, 28.92]**
Total events: 12 (Treatment), 2 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 3.63 (P = 0.00028)					
Test for subgroup differences: Not applicable					

Analysis 1.8. Comparison 1 Day-care vs control, Outcome 8 earning more than $1,000 per month at age 27 - females.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 8 earning more than $1,000 per month at age 27 - females

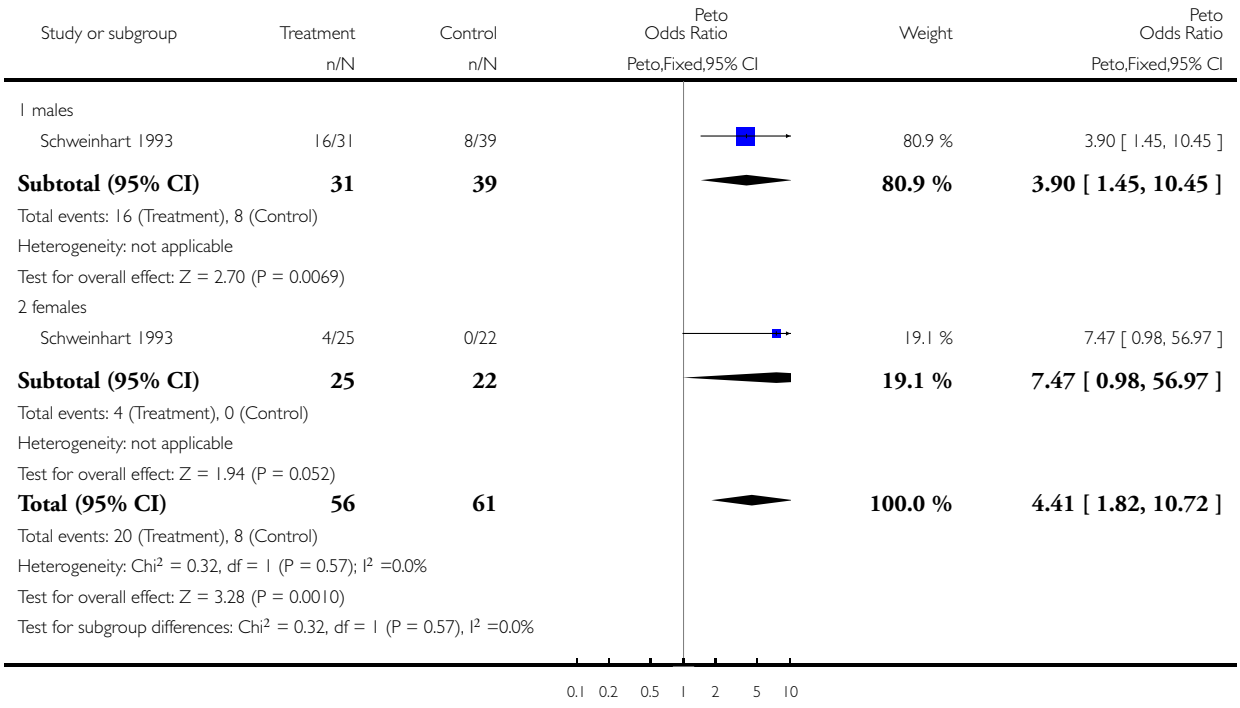
Study or subgroup	Treatment n/N	Control n/N	Peto Odds Ratio Peto,Fixed,95% CI	Weight	Peto Odds Ratio Peto,Fixed,95% CI
Schweinhart 1993	12/25	4/22		100.0 %	3.67 [1.11, 12.13]
Total (95% CI)	**25**	**22**		**100.0 %**	**3.67 [1.11, 12.13]**
Total events: 12 (Treatment), 4 (Control)					
Heterogeneity: not applicable					
Test for overall effect: Z = 2.13 (P = 0.033)					
Test for subgroup differences: Not applicable					

Analysis 1.9. Comparison 1 Day-care vs control, Outcome 9 home ownership at age 27.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 9 home ownership at age 27

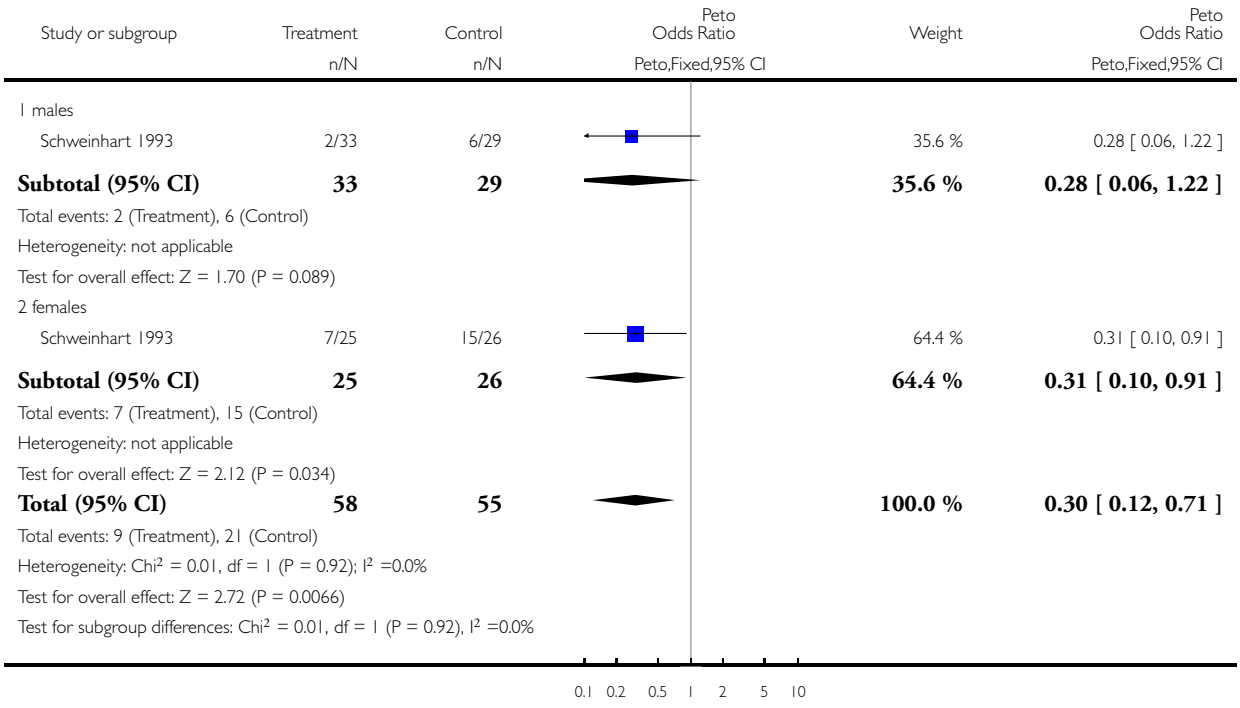


Analysis 1.10. Comparison 1 Day-care vs control, Outcome 10 welfare benefits at age 27.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 10 welfare benefits at age 27

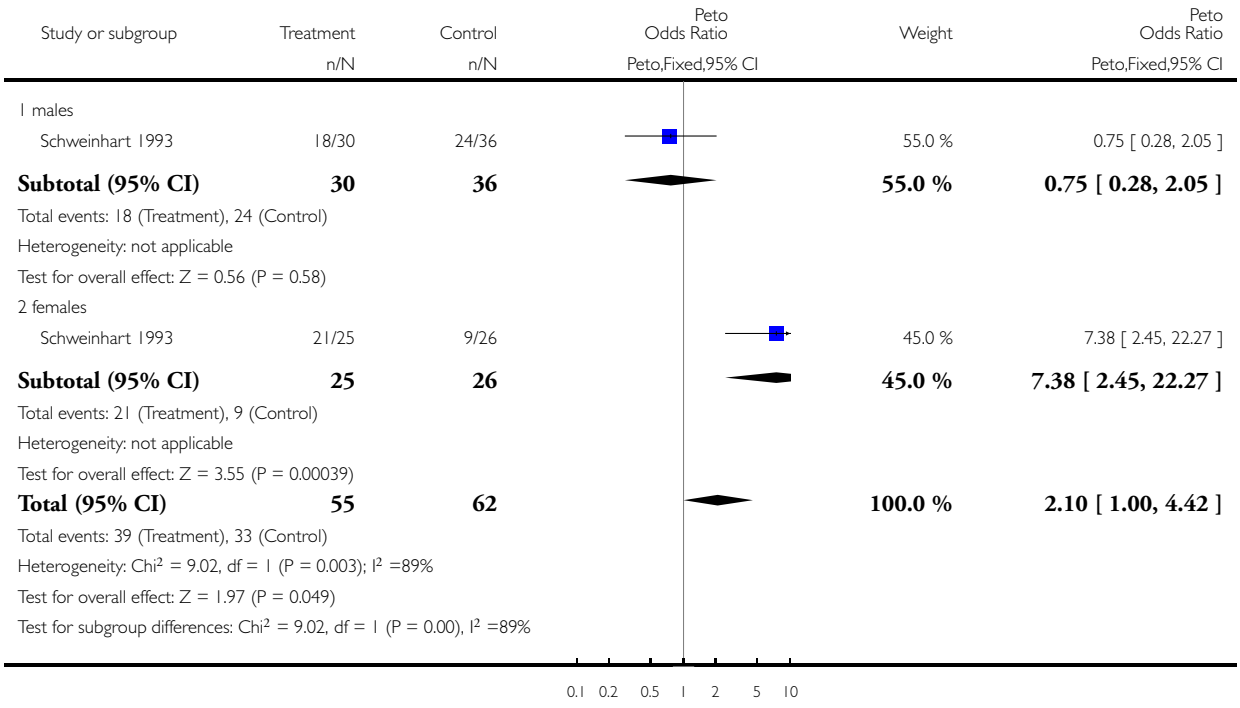


Analysis 1.11. Comparison 1 Day-care vs control, Outcome 11 high school graduate.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 11 high school graduate

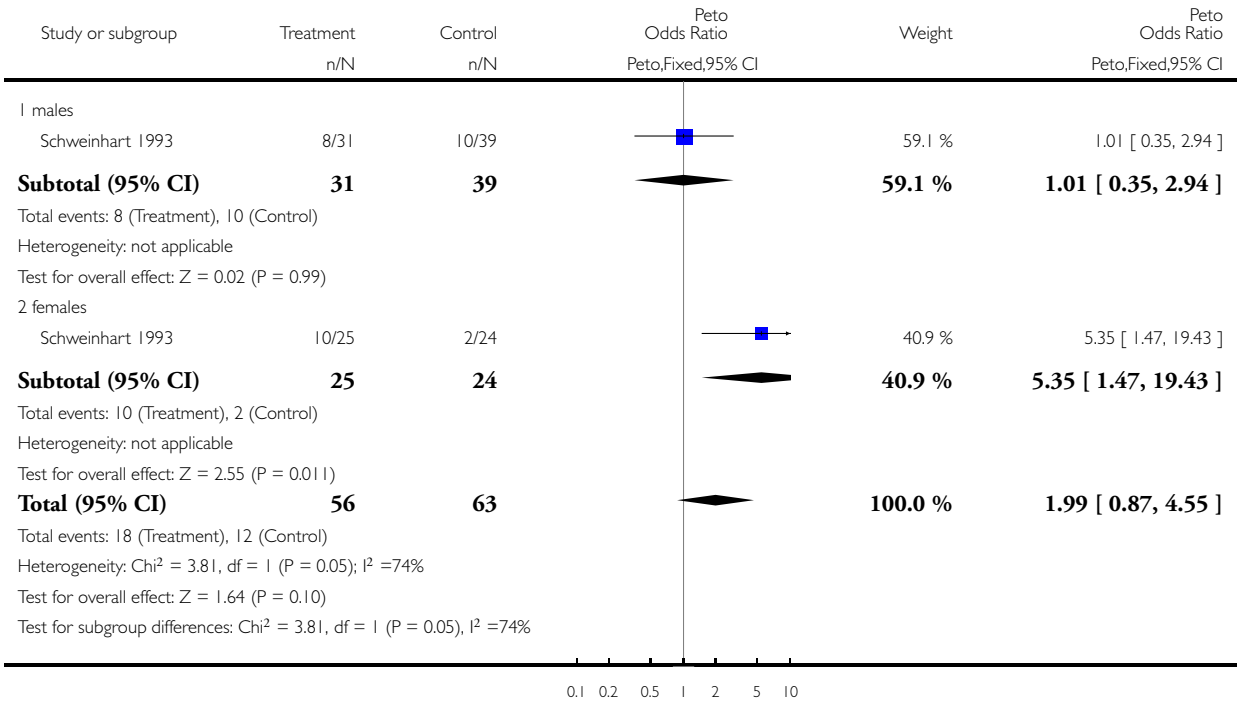


Analysis 1.12. Comparison 1 Day-care vs control, Outcome 12 married at age 27.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 12 married at age 27

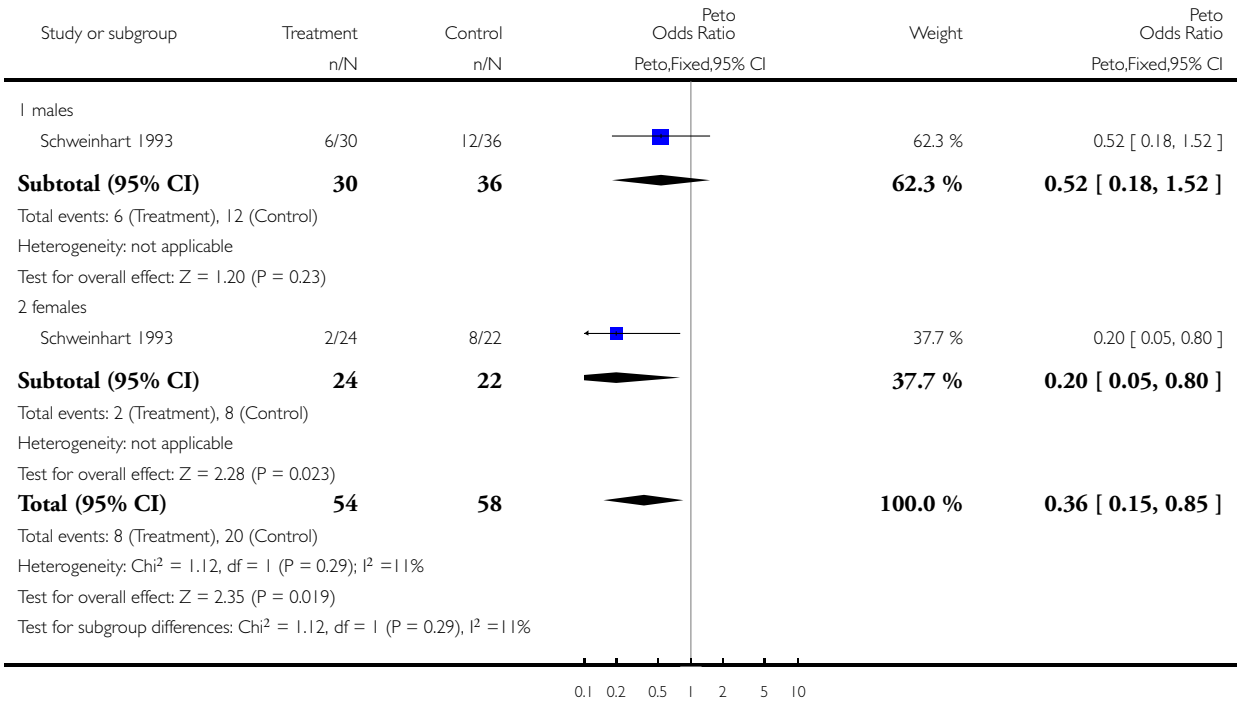


Analysis 1.13. Comparison 1 Day-care vs control, Outcome 13 placement for educable mental impairment.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 13 placement for educable mental impairment

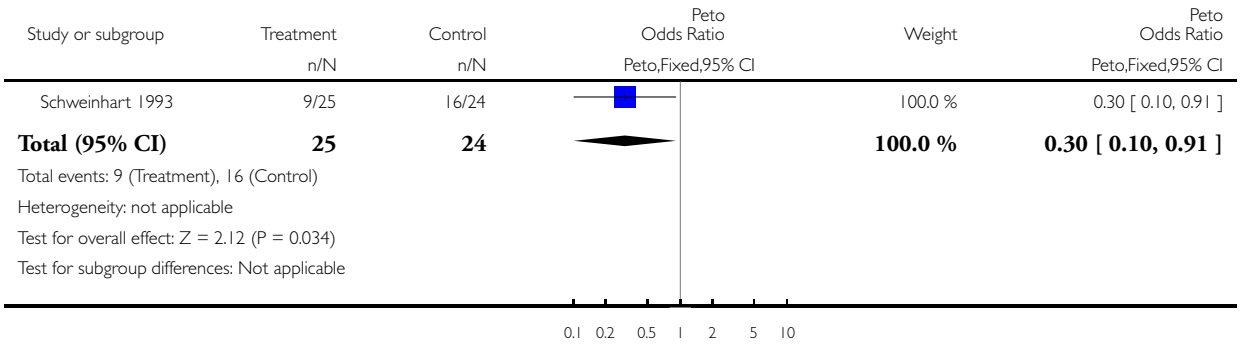


Analysis 1.14. Comparison 1 Day-care vs control, Outcome 14 births outside marriage - females.

Review: Day care for pre-school children

Comparison: 1 Day-care vs control

Outcome: 14 births outside marriage - females



FEEDBACK

Concerns about possibility of confounding

Summary

The Zoritch et al systematic review of day-care for pre-school children provides a highly systematic search and a thorough critical appraisal of studies. However, we are concerned that this review is misleading in a number of respects. Perhaps most importantly, is the problem of confounding, resulting from the fact that it was not possible to disentangle the combined effects of day-care, home visiting and parent training components of the interventions. The ambiguous use of the term 'day-care' and occasionally 'pre-school education' to refer to these combined programmes, results in the conclusion that it is 'day-care' to which the results of the review are attributable, rather than the combined programmes to which they are actually attributable.

The findings of this review have been used to support the development of preschool education services in the UK for disadvantaged populations (Acheson, 1998). However, this review does not provide evidence of the effectiveness of either preschool education services, or of day care more generally. The findings are based on eight studies of programmes which combined some element of day-care with home visiting and parent training/support. These combined programmes are all examples of early intervention projects the aim of which was to promote the development of infants and children from disadvantaged backgrounds, through the provision of high-quality programmes. To attribute these effects to 'day-care' is, however, erroneous since it is not possible to know whether the outcomes produced were the result of day-care, home-visiting or parent-training, and it seems likely that they were the result of all three. If the authors wished to conduct a review of educational pre-school day-care based only on evidence from RCTs, it might have been more useful to conduct a search for RCTs of more representative forms of educational preschool day-care in which the findings were not confounded by the effects of other interventions (such as home visiting and parent training/support). This may very well have shown that while there are now hundreds of published studies, there are currently no RCTs of pre-school educational day-care available. This would have been an important finding given the number of children who now spend such a large proportion of their waking hours, from an increasingly early age, in such day-care.

In addition to the fact that these projects combine day-care with other interventions, the day-care component of them is highly atypical of the type of care that most children in day-care receive. For example, the ratio of staff to children is 1: 1. Furthermore, the eight programmes which have been reviewed are highly heterogeneous. For example, in one study children attended 'day care' for only two

hours a day over a period of eight months in total, while in another study children attended seven hours a day, five days a week over the course of five years. Only some of the programmes used specific curricula, and the age of the children in the primary studies ranged from birth to 4 years. There would appear to be sufficient heterogeneity in both the populations studied and the interventions used, to preclude combining the results in the manner which has been undertaken.

The use of terminology in this review is also misleading in and of itself. The title of the review is 'Day care for preschool children'. The background clearly sets the stage for a review which will address the debate about 'where and by whom young children should be looked after', and cites figures from Meltzer's 1994 review of day care services in this country to show that 2% of under threes in Britain and 48% in Denmark use this sort of service. The objectives then go on to state that 'a systematic review was conducted to assess the effects of day- are on children and families'. The inclusion criteria then state that the type of intervention which was considered for inclusion in the review was 'non parental day-care for pre-school education'. In the abstract it states that the selection criteria were 'non-parental day-care for children under 5 years of age' with no mention of it being provided for the purpose of preschool education. The authors then go on in the discussion to switch between the terms 'day-care' and 'pre-school education', and to conclude that 'Day-care has a beneficial effect on children's development, school success, and adult life patterns'. Similarly, in the abstract it states that 'Day care increases children's IQ, and has beneficial effects on behavioural development and school achievement'. This review would be more accurate if it used the term early intervention projects, to describe the programmes, and not day-care or preschool education.

Day are services for children are typically divided into two main groups (excluding play groups) (i) day care which generally refers to children under three, and children receiving full-time care in nurseries or with child minders and relatives and; (ii) preschool education which typically refers to children over three in nursery education or kindergartens (Hennessy, Martin, Moss and Melhuish, 1992). This division has had serious implications in terms of the type of care children and parents have received (ibid.). Furthermore, while the research on preschool education has tended to show that 'preschool programmes can bring about beneficial outcomes, especially in children from disadvantaged backgrounds (Education Select Committee, 1989, in ibid., p. 19), the findings from day care has been much more ambivalent and nuanced (ibid). For example, the Hennessy and Melhuish 1991 non-systematic review of early day-care pointed to the way in which age at entry can be a confounding factor because the earlier the child enters a nursery, the more likely they are to be there for increased periods of time, and the greater the number of changes in day-care provision they are likely to have experienced by the time they enter school. Gender differences in outcome have also been reported.

Last, in the discussion, the authors of this review note that their conclusions are 'significantly different' to those derived from observational studies, which is that children in day-care show disturbed and difficult behaviour, (McGuire and Richman, 1988) or negative moods and aggressive behaviour, (Melhuish and Moss, 1991). Zoritch et al go on to explain this difference in terms of the distinction between well-designed RCTs and less well-designed observational studies. It might, however, be suggested that the significantly different finding which the authors highlight is not so much due to differences in the rigour of the methodology used, as to the differences in the interventions being evaluated e.g. the Zoritch et al review is about combined day-care, home visiting and parent training/support programmes while the McGuire and Richman study explores the differences in behaviour in three clearly defined preschool facilities - day nurseries, nursery classes in schools, and playgroups. Their paper states quite clearly that 'more children in day nurseries than nursery classes or play groups were identified with behaviour problems' (McGuire and Richman, 1988, p.1). Zoritch et al also use the findings of this review to counter the arguments of Belsky (1988) amongst others, which have shown that day-care starting below one year is likely to be associated with unsecure-avoidant attachment of child to mother, citing in support of their claims unpublished evidence from a large cohort study. This is not only inconsistent in that they have criticised evidence taken from observational studies in an earlier paragraph, but once again erroneous since only 4 of the studies included in this review are based on findings from children under the age of one year, and none of the included studies actually measure attachment status (3 studies measured mother-child communication and 1 study assessed 'closeness' and quality of relationships based on interviews when the children were 15 years of age).

It seems likely that the task of conducting a systematic review to establish the effects of preschool education and, indeed, day-care still requires to be undertaken. Such a review would hopefully not be confounded by the presence of other components such as home visiting and parent training. It would provide evidence from the most rigorous available studies, or possibly might highlight the absence of the type of rigorous evidence which is needed in order for us to be able to link type of day-care provision to developmental outcomes (ibid.).

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Belsky J, Rovine M (1988). Non-maternal care in the first year of life and security of infant-parent attachment. Child Development, 59, 157-167.

Hennessy E, Melhuish EC (1991). Early day-care and the development of school-age children: A review. Journal of Reproductive and Infant Psychology, 9, 117-136.

McGuire J, Richman N (1986). The prevalence of behaviour problems in three types of pre-school group. Journal of Child Psychology and Psychiatry, 34, 455-472.
Melhuish EC, Moss P (1990). Day-care for Young Children: International perspective. Routledge: London.
Meltzer H (1994). Day-care Services for Children. A survey carried out on behalf of the Department of Health in 1990. HMSO: London.
I certify that I have no affiliations with or involvement in any organisation or entity with a direct financial interest in the subject matter of my criticisms.

Reply

1. It is a fair comment that some studies combined elements of home visiting together
with day care. Only one study (Project Care) evaluated home visiting separately. 4 studies combined home visiting with day care, and in 3 day care was the only intervention. In the studies that combined home visiting and day care, day care was by far the more intense and the main intervention evaluated by authors. Home visiting was intended as supplementary intervention, usually on monthly basis. Parent training was formally given in only one study together with home visiting. This study was the smallest and had some methodological weaknesses as discussed in the review (Milwaukee Project). Therefore, in 4 out of 8 studies, day care was evaluated as stand alone intervention. The outcomes for children in these studies are convincingly positive. When home visiting was evaluated in comparison with day care (Project Care), day care shows more impressive effect in terms of outcome.
2. The trials provided high quality day care which is atypical. However, in this context, such intervention was found to be effective. There is a need for doing trials in real world setting which are sustainable regarding the staffing numbers and qualifications. Such trial has been funded in the UK by Department of Health.
The question of combining the results is a difficult one in most systematic reviews.
Although we accept that differences exist between the intervention and
populations, we felt that combining the results will aid clarity. However, the
results are available separately for readers to look at as well.
3. We agree that early intervention projects can be a term used to describe the
interventions we examined. This therefore includes day care, pre-school education
and in 5 studies combination of day care or pre-school education and home visiting.
It is clear from the studies that when day care intervention is described, elements of
age appropriate developmental stimulation have been included. However, pre-
school education seem to best describe the intervention given to children age 3
years or older. The largest study, Infant Health and Development Programme, is
delivered between ages of 1 and 3 years. This is carefully designed study, showing
positive outcomes especially for deprived children.
4. We can't know if the observational studies reporting negative effects of day care had very different populations and intervention. The chances are, they did. However, the evidence of effect from trials is accepted as more robust. Behavioural problems were not identified as more prevalent in the studies where intervention was given to younger children, such as Infant Health and Development Programme. We accept that quality and intensity of intervention has an important effect in terms of outcomes. Further studies are needed to evaluate the impact of different quality interventions.
5. Attachment is important concept. The studies that examined behavioural problems in this review did not give intervention in the first year of life. The next best evidence about attachment comes from NICHD large longitudinal study looking at the effects of day care in the first year of life on the child and mother-child interaction. These authors took great care to look at confounding factors in terms of attachment and used multiple regression analysis to analyse the effect of different factors. In the absence of attachment measurement in trials, this is the next best thing. In the presence of well designed longitudinal study it is not necessary, therefore, to rely on observational data when considering effect of day care on attachment. There was no significant main effect on either attachment security or avoidance of the mother in the strange situation at 15 months. If the mother was less sensitive and responsive, than more hours in child care, poorer child-care quality and more than one child care arrangement were associated with increase in insecure attachment. Insecure attachment is thought to lead to more problems in children's behaviour and socialisation. These outcomes were measured in trials reviewed and there was no difference found in two groups.
References:
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The effects of infant child care on infant-mother attachment security: Results of NICHD Study of early child care. NICHD Early Child Care Research Network. Child Development 1997; 68: 860-879.

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WHAT'S NEW

Last assessed as up-to-date: 30 May 2000.

Date	Event	Description
10 November 2008	Amended	Searches are currently being run prior to an update of this review. A new study is known to exist and an update of the review is expected soon with the help of two new reviewers, Rebecca Rees and Tami Toroyan
10 November 2008	Feedback has been incorporated	A reply from the author to a comment received concerning issues of potential confounding was made in Issue 3, 2001
10 November 2008	Amended	Converted to new review format.

HISTORY

Review first published: Issue 1, 1999

Date	Event	Description
30 May 2001	Amended	Response to feedback added
31 May 2000	New citation required and conclusions have changed	Substantive amendment
23 February 2000	Amended	Feedback added

(*Continued*)

23 February 2000	Amended	Minor update
26 October 1999	Amended	Reformatted

CONTRIBUTIONS OF AUTHORS

Bozhena Zoritch completed the protocol together with Ian Roberts and ann Oakley. Bozhena ran the searches required for the review and completed the analysis and writing up with editorial help from Ian Roberts and Ann Oakley.

DECLARATIONS OF INTEREST

None

INDEX TERMS

Medical Subject Headings (MeSH)

*Child Care; *Child Day Care Centers; Child Development; Randomized Controlled Trials as Topic

MeSH check words

Child, Preschool; Humans