

nates pamidronate and zoledronic acid are given intravenously whereas the principal oral agent was the non-aminobisphosphonate clodronate (see also [bmj.com](http://bmj.com)). Intravenous bisphosphonates have better bioavailability than oral bisphosphonates.<sup>20 21</sup> The pooled results of trials that used intravenous bisphosphonates were highly significant and mirror the primary analysis. In comparison, oral bisphosphonates showed a significant reduction in only vertebral and non-vertebral fractures, but numbers contributing to the analysis were small. Therefore, at present, most evidence supports the use of intravenous aminobisphosphonates.

Further research is needed to determine the optimum regimen required to treat patients with bone metastases. Clinical trials of bisphosphonates in other disease groups are needed.

We thank members of the project steering group (R A'Hern, R Chinn, D Dearnaley, M Dowsett, S Evans, D Feuer, J Hardy, C Normand, T Powles, D Wonderling) for their guidance. We are grateful to various authors and Novartis Pharmaceuticals who contributed unpublished data.

Contributors: See [bmj.com](http://bmj.com)

Funding: This review was funded by the NHS Health and Technology Assessment Programme. The conclusions do not necessarily reflect the views of the funding body. The guarantor accepts full responsibility for the conduct of the study, had access to the data, and controlled the decision to publish.

Competing interests: None declared.

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(Accepted 9 July 2003)



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BMJ 2003;327:472-5

## Child psychiatric disorder and relative age within school year: cross sectional survey of large population sample

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### Abstract

**Objective** To test the hypothesis that younger children in a school year are at greater risk of emotional and behavioural problems.

**Design** Cross sectional survey.

**Setting** Community sample from England, Scotland, and Wales.

**Participants** 10 438 British 5-15 year olds.

**Main outcome measures** Total symptom scores on psychopathology questionnaires completed by parents, teachers, and 11-15 year olds; psychiatric diagnoses based on a clinical review of detailed interview data.

**Results** Younger children in a school year were significantly more likely to have higher symptom scores and psychiatric disorder. The adjusted regression coefficients for relative age were 0.51 (95%

confidence interval 0.36 to 0.65,  $P < 0.0001$ ) according to teacher report and 0.35 (0.23 to 0.47,  $P = 0.0001$ ) for parental report. The adjusted odds ratio for psychiatric diagnoses for decreasing relative age was 1.14 (1.03 to 1.25,  $P = 0.009$ ). The effect was evident across different measures, raters, and age bands. Cross national comparisons supported a "relative age" explanation based on the disadvantages of immaturity rather than a "season of birth" explanation based on seasonal variation in biological risk.

**Conclusions** The younger children in a school year are at slightly greater psychiatric risk than older children. Increased awareness by teachers of the relative age of their pupils and a more flexible approach to children's progression through school might reduce the number of children with impairing psychiatric disorders in the general population.

## Introduction

Many studies have shown that the youngest children in a school year tend to be disadvantaged by the educational system.<sup>1-4</sup> As different countries use different cut-off dates for school entry, national comparisons are illuminating. Whereas children born between September and December are at an advantage in England, where they are the oldest in their class, children born in these months are at a disadvantage in Sweden, where they are the youngest in their class.<sup>5</sup> This is strong evidence for a "relative age" explanation based on the disadvantage of youth rather than a "season of birth" explanation based on seasonal variation in biological risk—for example, for prenatal infection. The educational disadvantage experienced by the youngest children in a class is not confined to the early school years but persists into secondary education and influences university entrance.<sup>2, 6</sup>

A study conducted in London more than 20 years ago suggested that "relative age" also influenced the rate of mental health problems in children.<sup>7</sup> We have re-examined this association. As "season of birth" has previously been linked to mental health problems,<sup>8</sup> we used the different cut-off dates for school entry in Scotland and in England and Wales as a "natural experiment" to evaluate the likely cause of psychological disadvantage for the youngest children.

## Methods

We used data collected in 1999 on a nationally representative sample of British 5-15 year olds.<sup>9</sup> In England and Wales, the cut-off date for school entry is 1 September; children must start school in the academic year during which they will become 5 years old. We followed the educational tradition of dividing children into autumn-born (the oldest third in the class, with birthdays in September to December), spring-born (with birthdays in January to April), and summer-born (the youngest third in the class, with birthdays in May to August) groups. In Scotland the cut-off date for determining school entry is 1 March, and the academic year begins in August. Children with birthdays in March to August must start school in the academic year during which they will become 5, whereas children with birthdays in September to February can start in the August preceding their fifth birthday or defer for a year. The proportion who defer is not centrally recorded, but inquiries to several local education authorities in Scotland indicated that the proportion of children deferring was around 1-12% in 2000-1 and was probably lower still in 1999 when the survey was conducted. We classified the Scottish sample into the oldest third (birthdays in March to June), the middle third (July to October), and the youngest third (November to February). As data on which children deferred school entry were not collected in our sample, we will have misclassified the relative age of a small number of children who deferred. For this reason, and also because the number of children in the Scottish sample was much smaller than that for England and Wales, we give greater emphasis in the analysis to the data for England and Wales. It is rare for children to repeat an academic year in the United Kingdom.

Our outcome measures included a dimensional measure of symptoms according to parents, teachers, and self report and the presence or absence of at least one psychiatric diagnosis.<sup>10</sup> The strengths and difficulties questionnaire is a well validated questionnaire that asks about children's emotions, behaviour, activity levels, peer relationships, and pro-social behaviour; it generates a total symptoms score.<sup>11</sup>

The development and wellbeing assessment consists of a structured interview administered by lay interviewers, who also recorded verbatim accounts of any reported problems.<sup>12</sup> Experienced clinicians used the transcripts combined with the symptom and impairment scores from all the available informants to make diagnoses according to internationally recognised criteria.<sup>10</sup> A disorder was diagnosed only if the symptoms had an important impact, in terms of distress or interference with the child's everyday life. Use of strict impact criteria led to a conservative prevalence rate of 9.5% for all psychiatric disorders,<sup>9</sup> which is towards the lower end of the range established by previous studies.<sup>13</sup>

## Results

Data were collected from 10 438 British children aged 5-15 years. Of these, 9383 (89.9%) children were living in England and Wales. The mean age of the total sample was 9.9 years. Being in the youngest third of the class was not significantly associated with any other sociodemographic (sex, ethnic group, social class) or family (number of children in the household, maternal educational level, family type) characteristics.

The results shown in the table for England and Wales show a significant increase in risk of psychopathology with decreasing relative age. This finding was not confined to younger children but persisted into those of secondary school age.

Multivariate analyses showed that relative age remained an independent risk factor for psychiatric disorder (odds ratio for relative age 1.14, 95% confidence interval 1.03 to 1.25) after adjustment for other important risk factors. The adjusted regression coefficients for relative age according to teacher reported difficulties (0.51, 0.36 to 0.65,  $P=0.0001$ ), parent reported difficulties (0.35, 0.23 to 0.47,  $P=0.0001$ ), and self reported difficulties (0.23, 0.03 to 0.43,  $P=0.03$ ) showed a similar relation with symptom scores regardless of informant.

The Scottish data look very similar to the data from England and Wales when plotted in terms of relative age (see [bmj.com](http://bmj.com)). This was not so when we replotted the data in terms of season of birth—for example, Scottish children born in January and February (and probably the youngest in their class) were at a disadvantage, whereas English and Welsh children born in the same months (but in the middle age band of their class) fared averagely.

## Discussion

We found that relative age was an independent risk factor for psychopathology in 5-15 year olds, thereby confirming and extending previous findings.<sup>7</sup> The national comparison between Scotland on the one hand and England and Wales on the other hand

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Percentage of children with any psychiatric disorder and mean symptom score on the parent, teacher, and self completed strengths and difficulties questionnaire by relative age for England and Wales

Outcome measure	Oldest third (n=3134)	Middle third (n=3014)	Youngest third (n=3235)	Significance
<b>All ages</b>				
Any psychiatric diagnosis* (n=9383)	8.3 (7.4 to 9.3)	8.8 (7.8 to 9.8)	9.9 (8.9 to 10.9)	$\chi^2=4.58$ , P=0.03
Parent reported symptoms† (n=9267)	8.2 (8.0 to 8.4)	8.4 (8.2 to 8.6)	8.8 (8.6 to 9.0)	$r=0.05$ , P<0.001
Teacher reported symptoms† (n=7452)	6.2 (5.9 to 6.4)	6.6 (6.3 to 6.8)	7.0 (6.8 to 7.3)	$r=0.06$ , P<0.001
Self reported symptoms† (n=3799)	10.2 (9.9 to 10.4)	10.4 (10.1 to 10.7)	10.6 (10.4 to 10.9)	$r=0.04$ , P=0.02
<b>Ages 5-10</b>				
	(n=1786)	(n=1712)	(n=1843)	
Any psychiatric diagnosis* (n=5341)	7.4 (6.2 to 8.4)	7.1 (5.9 to 8.3)	8.5 (7.2 to 9.8)	$\chi^2=1.34$ , P=0.2
Parent reported symptoms† (n=5288)	8.3 (8.0 to 8.6)	8.5 (8.2 to 8.8)	9.0 (8.8 to 9.3)	$r=0.05$ , P<0.001
Teacher reported symptoms† (n=4371)	6.2 (5.9 to 6.5)	6.7 (6.4 to 7.0)	7.3 (7.0 to 7.6)	$r=0.08$ , P<0.001
<b>Ages 11-15</b>				
	(n=1348)	(n=1302)	(n=1392)	
Any psychiatric diagnosis* (n=4042)	9.5 (7.9 to 11.1)	11.0 (9.3 to 12.7)	11.7 (10.0 to 13.4)	$\chi^2=3.49$ , P=0.06
Parent reported symptoms† (n=3979)	8.0 (7.7 to 8.3)	8.3 (8.0 to 8.6)	8.6 (8.2 to 8.9)	$r=0.04$ , P=0.02
Teacher reported symptoms† (n=3081)	6.1 (5.7 to 6.4)	6.3 (5.9 to 6.7)	6.6 (6.2 to 7.0)	$r=0.03$ , P=0.06
Self reported symptoms† (n=3799)	10.2 (9.9 to 10.4)	10.4 (10.1 to 10.7)	10.6 (10.4 to 10.9)	$r=0.04$ , P=0.02

\*Percentage (95% confidence interval);  $\chi^2$  test.

†Mean score (95% confidence interval); Pearson correlation coefficient.

strongly indicated that the key explanatory variable was relative age rather than season of birth. It is common for an environmental “risk factor” to turn out to be either a marker for some previously unmeasured confounder or a consequence of the child’s or parents’ genotype. This is unlikely to be the case for relative age, which is unrelated to any other recognised risk factor and determined by an arbitrary cut-off imposed by the local or national government.

When thinking about individual children, the effects of relative age will generally be dwarfed by the much larger effects of well recognised risk factors such as family discord, adverse life events, or failure at school.<sup>9</sup> Our findings do not provide clear guidance to schools and families who are trying to decide whether deferral of school entry will benefit an individual child. Despite being a modest effect at an individual level, the influence of relative age on psychopathology could nevertheless prove important at a public health level. Steps to reduce the stresses associated with being the youngest in a class might result in only a small decrease in children’s average level of psychopathology but could nevertheless result in a worthwhile reduction in the number of children with severe problems. If all children had the same risk of psychiatric disorder as that currently experienced by the oldest children in the class, the overall prevalence would fall from 9.0% (the average of oldest, middle, and youngest) to 8.3% (table), corresponding to a population attributable risk of 8%. More than 8 million children aged 5-15 live in Britain,<sup>14</sup> of whom approximately 750 000 probably have a psychiatric disorder.<sup>9</sup> Around 60 000 of these cases of child psychiatric disorder might be prevented if the youngest and middle children in a school year were at no more risk than the oldest children.

The impact of relative age on psychopathology might be amenable to simple interventions. Several studies suggest that teachers often forget to make allowances for relative age, expecting too much of the younger children and being more likely to see them as failing.<sup>4 7 15 16</sup> Simple practical classroom interventions such as calling the register in birth order or grouping children in the classroom by relative age may help to sensitise teachers to the age position of individual children within the class, thereby reducing the likelihood of unrealistic expectations being placed on younger

### What is already known on this topic

Being among the youngest children in a school year is associated with educational disadvantage

Teachers often forget to make allowances for differences in age within the school year

Younger children in a school year may be at greater psychiatric risk

### What this study adds

It is “relative age” in the school year rather than “season of birth” that influences mental health

The tendency for the younger children in a school year to have more mental health problems is evident across different measures, raters, and age bands

Although the effect is weak at an individual level, it could prove important at a public health level

children. Streaming children according to their relative age within each year group may also be helpful, as may allowing children who are struggling to repeat a year. In New Zealand, children spend between 12 months and 24 months in a reception or preparatory class, with progression to the next class being determined by the child’s maturity and academic competence. Similarly, Scottish parents can choose to defer school entry for relatively young children who do not seem ready for school. The impact of such social experiments could be evaluated by randomised controlled trials.

Contributors: See bmj.com

Funding: The original survey was funded by the British Department of Health. JG and TF are currently supported by Wellcome Trust research training fellowships. The guarantor accepts full responsibility for the conduct of the study, had access to the data, and controlled the decision to publish.

Competing interests: None declared.

Ethical approval: The ethical committee of the Institute of Psychiatry, King’s College London approved the study.

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(Accepted 9 July 2003)

## Effectiveness of dynamic muscle training, relaxation training, or ordinary activity for chronic neck pain: randomised controlled trial

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### Abstract

**Objective** To determine the effectiveness of dynamic muscle training and relaxation training for chronic neck pain.

**Design** Randomised controlled trial.

**Setting** Five occupational healthcare centres, Tampere, Finland.

**Participants** 393 female office workers (mean age 45 years) with chronic non-specific neck pain randomly assigned to 12 weeks of dynamic muscle training (n = 135) or relaxation training (n = 128), plus one week of reinforcement training six months after baseline; or ordinary activity (control group; n = 130).

**Main outcome measure** Change in intensity of neck pain at three, six, and 12 months.

**Results** No significant difference was found in neck pain between the groups at follow up. However, the range of motion for cervical rotation and lateral flexion increased more in the training groups than in the control group.

**Conclusions** Dynamic muscle training and relaxation training do not lead to better improvements in neck pain compared with ordinary activity.

### Introduction

Neck pain is common, especially among women, and around 67% of adults will have neck pain sometime during their life.<sup>1,2</sup> The underlying pathology of neck disorders remains unclear, so treatments are aimed at pain relief. Dynamic muscle training and relaxation training are often prescribed for chronic neck pain despite a lack of evidence on their effectiveness.<sup>3-10</sup> We aimed to assess the effects and costs of dynamic muscle training and relaxation training for chronic neck pain in female office workers.

### Participants and methods

The catchment population comprised female office workers whose employers had a contract with one of the large occupational healthcare centres in Tampere, Finland. Eligible women were those aged 30-60 years who had had chronic non-specific neck pain for at least 12 weeks. Participants were recruited by occupational health physicians from February 1996 to March 1998.

Baseline data included potential confounders, effect modifying factors, and factors related to neck disorders. Participants were examined by MV and a physiotherapist at the Tampere Regional Institute of Occupational Health. The physiotherapist measured the cervical range of motion (rotation, lateral flexion, flexion and extension) and the dynamic muscle strength of the neck and shoulder region. Participants agreed not to tell the research staff or occupational health staff their particular intervention.

### Randomisation and treatments

A research assistant randomised participants to either dynamic muscle training, relaxation training, or ordinary activity (control group). Treatment allocation was concealed in a numbered opaque envelope, which was opened by the physician after baseline measurements had been taken and the participants had completed a questionnaire. To ensure internal validity one physiotherapist performed all the measurements blinded to treatment allocation at baseline and follow up. It was not possible to blind the patients.

Both intervention groups were instructed and trained by a physiotherapist three times a week for 30 minutes each over 12 weeks, followed by one week of reinforcement training six months after randomisation. Training was conducted by experienced physiotherapists in groups of up to 10 people.

Dumbbells were used for dynamic muscle training. The exercises, conducted in the same order in each

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BMJ 2003;327:475-7