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HEIGHTS AND WEIGHTS OF DA-AN BOYS: DID SISTERS REALLY MAKE A DIFFERENCE?

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Summary. This study further examined the negative association between boys' growth and the presence of sisters within a relatively affluent community in Taipei, Taiwan. Among 596 boys born in 1976–77, differences in height and log-transformed weight were judged using analysis of covariance (ANCOVA) with measurement age as a covariate, and parental education level (four levels), number of sisters (0, 1, 2 or 3+) and number of brothers (0, 1, 2+) as predictors. The relative importance of birth order and sibling sex was examined among the near majority of boys with one sibling (47%, 278/596). The sibling composition variable was defined using mutually exclusive categories representing individuals with one sibling: either one older or younger brother or sister. All boys contributed information before leaving middle school at a mean age of $14{\cdot}9 \pm 0{\cdot}4$ years SD. The results were compared with similar analyses of data for 154 of these same boys for whom measurements were available from primary school entry at a mean age of $6{\cdot}4 \pm 0{\cdot}3$ years SD onward. Results were also compared with data for a cohort of 153 boys who entered primary school later in 1986. Results confirm that boys from the Da-an area born in the mid-1970s who did not have sisters were significantly taller (2·2–2·5 cm, $p \leq 0{\cdot}008$) and heavier (3·0–3·9 kg, $p \leq 0{\cdot}016$) than those with one or two sisters. However, the 26 boys with three or more sisters, most of whom were last-born, were somewhat taller than those with one or two sisters. The same curvilinear relationships in height and weight appeared both among boys as they prepared to leave middle school and among the subset also measured just after entering primary school. When numbers of sisters were statistically controlled, the presence of two or more brothers was also significantly negatively associated with mean stature, but not weight, among middle school boys. Analyses among boys with one sibling revealed that birth order was associated with mean stature, but only if the sibling was female; an older sister was associated with a greater deficit in mean stature than a younger sister. Evidence of rising educational expectations, continued declines in family size with fewer gender-related differences in numbers of siblings, and a clear secular increase in body size in this community among children entering primary school from 1982 to 1986 suggest a possible explanatory model.

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Introduction

A recent article (Floyd, 2003) examined implications of Skinner's (1997) argument that family systems tend to bias family planning decisions in various ways that affect family composition and influence the treatment of children. The study of primary school children born in two areas within Taipei, Taiwan, in the mid-1970s found sex-related differences in numbers of siblings and parity-stopping ratios that supported Skinner's model (1997) of the impact of patrilineal kinship on parental valuation of offspring. These results paralleled findings from demographic surveys in Taiwan (Coombs & Sun, 1978; Weinstein *et al.*, 1990; Freedman *et al.*, 1994b; Lee & Sun, 1995). Despite significant differences in preferred family size related to education and background, even families desiring relatively few children tended to prefer sons. There was, however, evidence that better educated families in the more affluent of the two areas were more willing to accept having only daughters.

One of the initial expectations in the first study was that boys who had to share the attention and resources of their parents with a brother would be significantly shorter than those who did not. Some evidence for this view was found among boys in the less affluent area; boys with older or younger brothers were 2·0 cm shorter on average than boys with no brothers ($p=0{\cdot}002$). In this group the presence of sisters had virtually no influence on boys' mean heights. In the more affluent community, however, only those boys who also had a sister or sisters appeared to be influenced by the presence of brothers. Consistent with this, but initially unanticipated, boys in the more affluent of the two communities who had sisters were noticeably shorter, on average, than those who did not ($\Delta=2{\cdot}1$ cm, $p=0{\cdot}007$).

The present study was accomplished primarily to verify that the relationships between boys and their sisters identified in the previous study could be generalized to all boys in the area born in the same years. This was important, as the findings in the Da-an area were initially unanticipated, and could have reflected coincidental relationships peculiar to the first data set. If prior results represented a phenomenon common to most boys in the area, we expect to find similar relationships among a much larger sample measured before leaving middle school. Boys with one or more sisters should be, on average, significantly shorter than those without. Boys with brothers should also be shorter than those without, but only if they also have sisters. While the initial study was limited by samples size to primarily examining presence–absence contrasts, the larger data set available here allowed a more thorough evaluation of numbers of sisters and brothers and their relative order.

Given the very rapid pace of change in Taiwan (Hermalin *et al.*, 1994), the potential for changing relationships among birth cohorts over time was also evaluated with available data. If the differences in stature previously detected were related to interactions between changing parental behaviour, socioeconomic circumstances and greater inherent male sensitivity, then increases in disposable income and improvements in health care available to later cohorts would be expected to diminish the impact of these interactions. Substantial secular increases in body size in Taiwan in the recent past reflecting both reduced stunting and earlier maturation are well documented (Huang & Malina, 1995; Floyd, 2002). Evidence of secular increases in children's growth in this particular community was judged using changes in mean height among boys and girls in the area entering primary school in each year from

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1982 to 1986. Changing attitudes about the relative value of daughters were indirectly assessed by comparing gender differences in numbers of siblings found among primary school children entering school in 1982, 1983 and 1986. As in the prior study, it was assumed that when a child was born, their parents weighed the importance of achieving a desired gender configuration with the potentially conflicting goal of limiting completed family size. To the extent that families in an area favoured a son or sons, girls were anticipated to have more siblings than would be expected by chance alone. Indications that the relative value of daughters rose were inferred if such gender-related biases in sibling number diminished (Coombs & Sun, 1978). Changes in the impact of sisters on growth were judged by comparing least squares adjusted mean heights and weights of boys entering primary school in 1982 and 1983 with values for boys entering in 1986 derived using the same model.

Subjects and Methods

The present study used information from the health records of children of southern Chinese ancestry collected from one primary school and one middle school in the Da-an area of Taipei. Children of families from central or northern Chinese provinces were excluded because they were significantly taller and heavier on average (B. Floyd, in review). Within each school, a single nurse following Ministry of Education guidelines and using standard equipment measured heights and weights at the beginning of each semester over the periods considered here. As in another study that used similarly collected data from Japan (Nariyama *et al.,* 2001) no direct estimates of measurement error were available. Indirect estimates from longitudinal measurements of girls from the same schools using a method outlined by van't Hof & Kowalski (1979) suggest only moderate levels of error (Floyd, 1998, 2000). Information about parental education, and family size and composition were self-reported by parents. Fathers' education was usually reported, between 88·4% and 90·2% of the time among groups considered. All statistical tests were two-sided and carried out using SYSTAT 6·0 (Wilkinson *et al*., 1994a, b).

For the initial period, the influence of numbers of sisters (0, 1, 2 or 3+) and brothers (0, 1, 2+) on growth was addressed using height and weight data for 596 boys born in 1976 and 1977. The extent of differences was judged using analysis of covariance (ANCOVA) with measurement age as a covariate, and parental education level, number of sisters and number of brothers as predictors. Parental education levels were divided into four categories: those completing 6 years or less, 9 years, 12–14 years, and 16 or more years of formal education, respectively. All boys contributed information before leaving middle school at a mean age of $14{\cdot}9 \pm 0{\cdot}4$ years SD. Weights were log-transformed in ANCOVA to better meet distributional assumptions, but results are reported in original units. The homogeneity of slopes assumption was tested using full models with all interactions included. No interactions were statistically significant ($p>0{\cdot}10$). Residuals from these models were normally distributed around zero with no outliers.

The relative importance of birth order and sibling sex was examined among the near majority of boys with one sibling (47%, 278/596). The ANCOVA model used included the covariate measurement age and parental education level as defined

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above. The sibling composition variable was defined using mutually exclusive categories representing individuals with one sibling: either one older or younger brother or sister. Initially the same model was applied to other mutually exclusive categories involving two siblings, but while the results were quite consistent with those reported, there were generally fewer than 20 boys in a given category and have, therefore, not been reported upon further.

If differences in growth related to sibling composition were the byproduct of changing familial circumstances and behaviour that biased care-givers towards first-born daughters to the disadvantage of a following son, then deficits in mean stature were likely to have substantially accrued before entry into primary school. This assumption could be partially checked using a repeated-measures analysis of height within a subset of 154 of the boys for whom serial measurements since entry into primary school were available.

The possibility also exists that differences in mean stature among those with or without older sisters partially reflected differences in average developmental timing. This could be examined by comparing longitudinal estimates of age at peak height velocity (APHV) obtained by modelling semi-annual serial growth data (B. Floyd, unpublished research) available for the 154 boys already mentioned using the Preece–Baines Model 1 (PB1) function (Preece & Baines, 1978). As 14% of the boys (22/154) were not sufficiently near adult height when leaving middle school to derive estimates using the PB1 model, a Fisher exact test was also used to judge whether those that could not be modelled were significantly more likely to have older sisters than those that could be.

Evidence of changing circumstances in the community was assessed as follows. Secular increases in male and female growth were judged using ANCOVA. Mean heights of a large sample of boys ($n=731$) and girls ($n=649$) measured upon entry into the same primary school in 1982–1986 were examined for evidence of a significant upward trend. Measurement age served as a covariate. Sub-sample sizes in each year ranged from 113 to 157. Among boys, the same comparisons were also made with a reduced sample, numbers in 1982 and 1983 being limited to the subset of 154 boys with complete data on parental education levels and numbers and sex of siblings. This allowed some assessment of how representative this subset was.

Differences in family size and composition preferences were indirectly assessed using numbers of siblings of girls or boys entering primary school in 1982, 1983 and 1986 among the subset for whom such data were available. Kruskal–Wallis test statistics were used to judge the extent of difference between median numbers of siblings by sex across the three school years. Finally, results of ANCOVA from the boys born in 1976 or 1977 were compared graphically with the same analyses of heights and weights of 153 more boys who entered school in 1986, though interpretations are constrained by the small numbers of boys with more than two sisters.

Results

Within the Da-an study area, among boys finishing middle school, those without sisters were significantly taller, on average, than those with one or two sisters when

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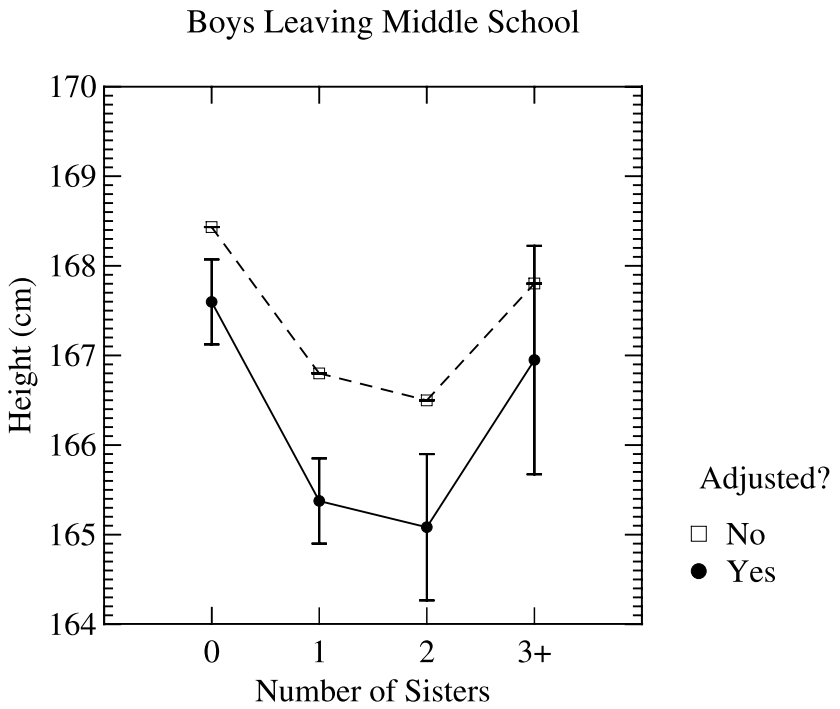


Fig. 1. Significant curvilinear associations between numbers of sisters and mean height (± SE) among 596 middle school boys at a mean age of 14·9 ± 0·4 years SD in the Da-an area (unadjusted, $p=0{\cdot}025$; adjusted for parental education and numbers of brothers, $p=0{\cdot}002$; n values for 0, 1, 2 and 3+ sisters were 235, 265, 70 and 26, respectively).

measurement age was controlled, whether or not adjustments were made for parental education and number of brothers. Figure 1 shows this statistically significant curvilinear relationship (unadjusted, $p=0{\cdot}025$; adjusted, $p=0{\cdot}002$). Controlling for parental education and number of brothers increased differences by about 0·6 cm among those with one or two sisters. Pair-wise comparisons indicate that the 235 boys with no sisters were 2·2 cm taller ($p<0{\cdot}0005$) than the 265 with one and 2·5 cm taller than the 70 with two ($p=0{\cdot}008$). They were not, however, significantly taller than the 26 boys with three or more sisters ($\Delta=0{\cdot}6$ cm, $p=0{\cdot}64$). Figure 2 reveals very similar relationships among the subset of 154 boys also measured just after entering primary school about 8·5 years earlier. The decrements between those without sisters and those with one, two or three or more were 2·1 cm, 2·5 cm and 1·3 cm, respectively. Only the first of these comparisons was statistically significant ($p=0{\cdot}019$) given the small sample size.

The same curvilinear association may be seen between numbers of sisters and middle school boys' mean weights in Fig. 3. Boys without sisters were, on average, 3·0 kg heavier ($p=0{\cdot}006$) than those with one sister and 3·9 kg heavier ($p=0{\cdot}016$) than those with two. As with height, the few boys (4·4%, 26/595) with three or more sisters were insignificantly lighter than those with none ($\Delta=0{\cdot}7$ kg). A similar pattern of

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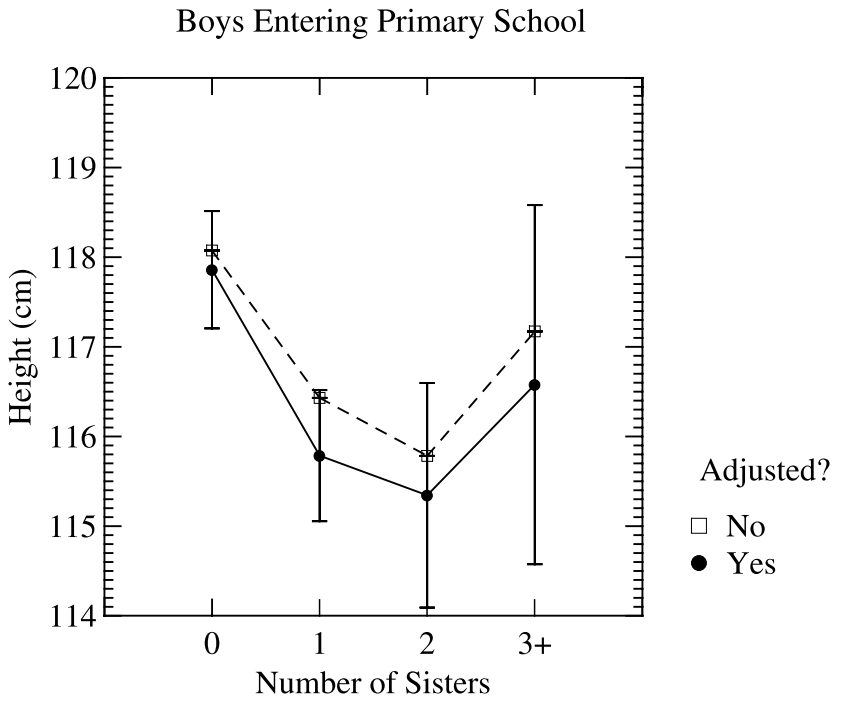


Fig. 2. A curvilinear association between numbers of sisters and mean height (±SE) among a subset of 154 boys who were also measured soon after entering primary school at a mean age of 6·4 ± 0·3 years SD (*n* values for 0, 1, 2 and 3+ sisters were 73, 60, 15 and 6, respectively).

decline in mean weights existed among the 154 boys measured when around 6–7 years of age, but the smaller decrements of 0·7 kg for those with one sister and 1·1 kg for those with two were not statistically significant.

Similar to the relationship reported in the initial study, the number of brothers was associated with mean height among males as they finished middle school, but only if the number of sisters was included in the model first. The comparisons permitted by the present study's larger sample revealed that the difference was not between the mean heights of the 244 boys with no brother and the 271 with one: only 0·4 cm separated them. The significant differences were between the mean height of the 81 boys with two or more brothers (164·9 cm) and those with no brothers (+2·2 cm, $p=0·017$) or those with one (+1·8 cm, $p=0·031$). Differences in mean weight among those with no, one or two or more brothers followed a similar pattern, though none of the decrements, ranging from 0·5 kg to 1·4 kg, was statistically significant.

Modelling the effects of birth order and sibling sex on growth of the 278 middle school boys with one sibling produced results that agree with analyses just reported, but help clarify the relationship between birth order and sibling sex. As shown in Fig. 4, having an older as opposed to a younger brother made relatively little difference in mean stature. Birth order of sisters appears to have been more important, though.

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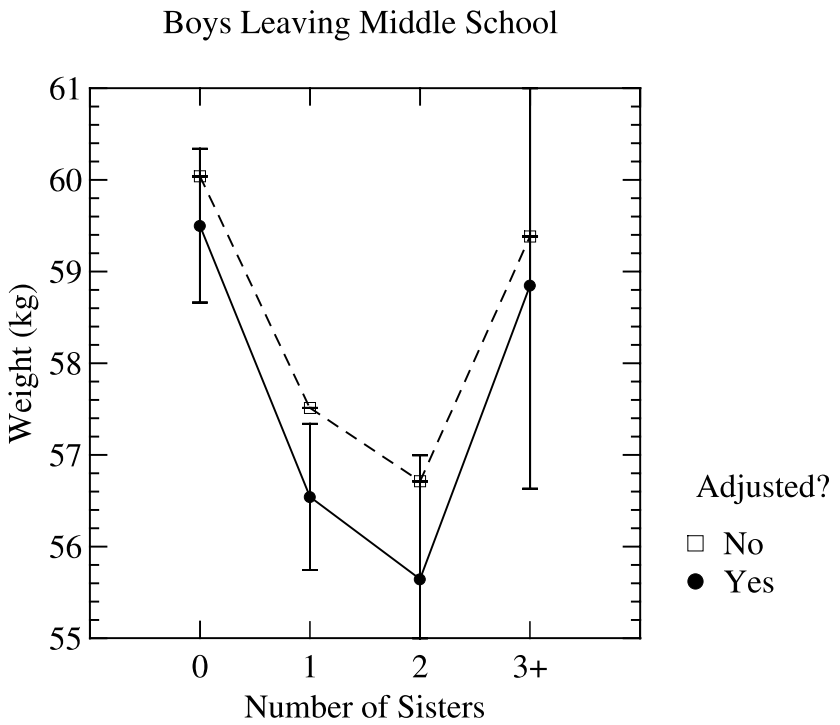


Fig. 3. Significant curvilinear associations between numbers of sisters and mean weight (± SE) among 595 middle school boys at a mean age of 14·9 ± 0·4 years SD in the Da-an area (unadjusted, $p=0{\cdot}031$; adjusted for parental education and number of brothers, $p=0{\cdot}020$; n values for 0, 1, 2 and 3+ sisters were 235, 264, 70 and 26, respectively).

With measurement age and parental education level controlled, the 63 boys with one older sister were 3·1 cm shorter ($p=0{\cdot}006$) than the 52 boys with one older brother and 2·6 cm shorter ($p=0{\cdot}009$) than the 86 boys with one younger brother. Among the 77 boys with a younger sister, these decrements were 1·6 cm and 1·2 cm, respectively ($p \leq 0{\cdot}139$).

Mean weights, retransformed, show a similar pattern (Fig. 5), though boys with a younger brother were modestly heavier (0·8 kg) than those with an older brother. Those with an older sister were 3·3 kg lighter than those with an older brother ($p=0{\cdot}089$) and 4·1 kg lighter than those with a younger brother ($p=0{\cdot}016$). As with stature, boys with younger sisters were not as affected.

The repeated-measures analysis among the subset of 154 boys for whom data were available both at primary school entry and middle school departure supported the view that deficits were already present upon primary school entry. Significant between-group differences among those with or without sisters were found ($p=0{\cdot}017$), but no significant within-group difference appeared. The pattern of differences in mean height when the birth order of sisters was distinguished remained the same as well within members of this group at the two ages considered.

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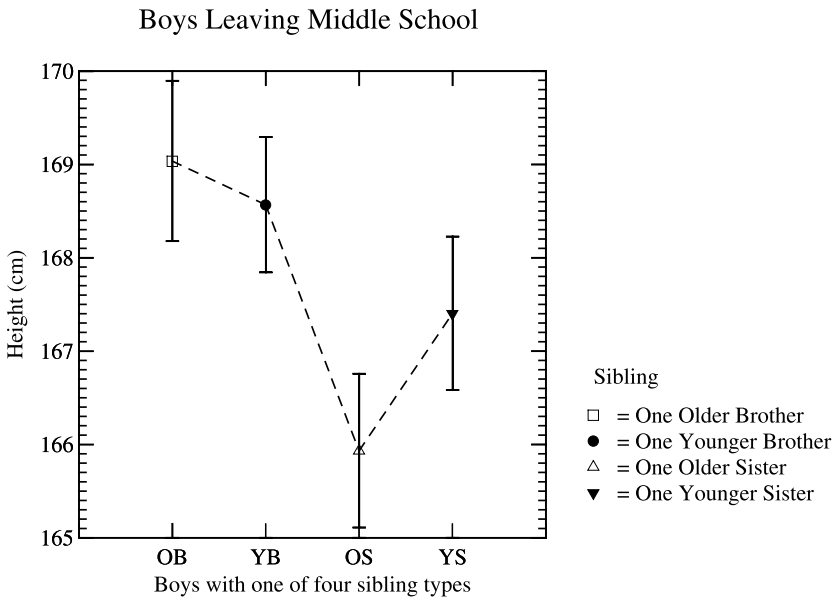


Fig. 4. The greater impact of an older sister on mean height (± SE) as judged among 278 boys with only one sibling (*n* values for sibling categories from left to right are 52, 86, 63 and 77).

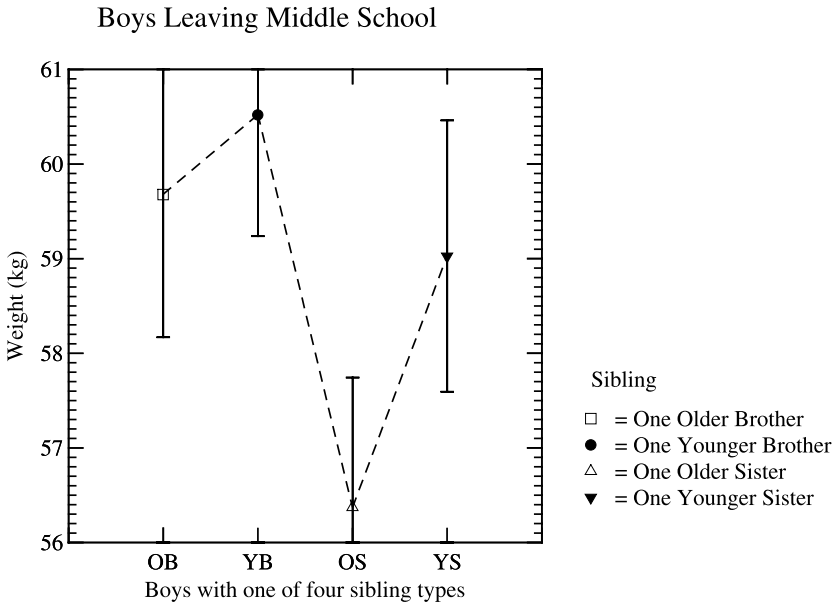


Fig. 5. The greater impact of an older sister on mean weight (± SE) as judged among 277 boys with only one sibling (*n* values for sibling categories from left to right are 52, 86, 62 and 77).

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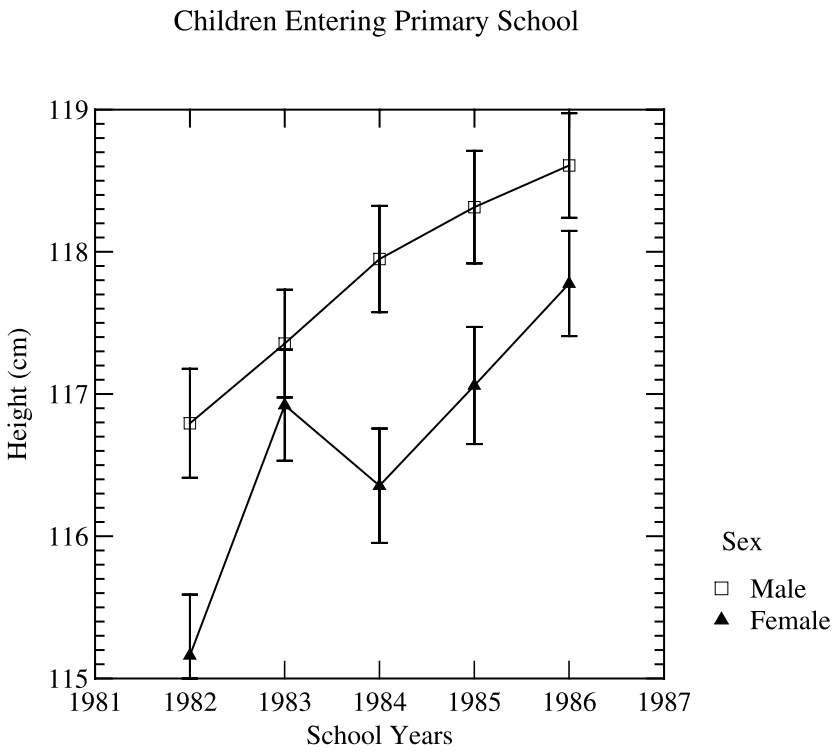


Fig. 6. Secular change in mean heights (± SE) among boys and girls entering a primary school in the Da-an area in 1982 to 1986 at a mean age of 6·4 ± 0·3 years SD (*n* values per year are 143, 147, 151, 134 and 157 for boys and 112, 135, 128, 122 and 155 for girls, respectively).

Among the 86% of boys (132/154) for whom APHV could be estimated using the PB1 model, comparisons indicated that with parental education and numbers of brothers statistically controlled, mean APHV was 0·1 year greater for the 37 boys with older sisters than the 95 without. This was not statistically significant. There was, however, a statistically significant association suggesting that the 22 boys who were not sufficiently mature to be modelled were more likely than chance to have at least one older sister (11/48 vs 11/106; Fisher exact test: $p=0{\cdot}048$).

Evidence of rapid change within the community came from several sources. Figure 6 shows significant increases in mean height among boys and girls just after entry into primary school ($p<0{\cdot}0005$) across the five years considered. At a mean age of 6·40 years, boys in 1986 were 1·8 cm taller than their counterparts in 1982 (118·6 cm vs 116·8 cm). The greatest incremental increases of about 0·6 cm appear in the first two yearly intervals with increases tapering off slightly in the last two. If the male comparison was limited in 1982 and 1983 to just those 154 boys who also occurred in the middle school data set, results are virtually the same. This suggests that this subset is representative with respect to growth parameters. Among girls who averaged 6·42 years of age the overall increase in mean stature during the five-year period was

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Table 1. The distribution of primary school girls or boys by numbers of siblings in three school years

Sex	School year	Number of siblings per child[a]						
		Zero	One	Two	Three	Four	Five	Total (*n*)
Female[b]	1982	3·5%	40·0%	37·7%	14·1%	2·4%	2·4%	85
	1983	4·6%	41·7%	34·3%	11·1%	7·4%	0·9%	108
	1986	12·5%	53·5%	29·2%	1·4%	2·8%	0·7%	144
Male[c]	1982	3·6%	47·3%	36·4%	10·9%	1·8%	0·0%	55
	1983	10·1%	51·5%	27·3%	8·1%	2·0%	1·0%	99
	1986	11·8%	56·9%	25·5%	4·6%	0·7%	0·7%	153

[a]In 1982 and 1983 data only available for those children with matched records.
[b]Kruskal–Wallis test statistic=21·38; p=0·00002.
[c]Kruskal–Wallis test statistic=7·30; p=0·026.

2·6 cm: from 115·2 cm in 1982 to 117·8 cm in 1986. Although among girls every yearly increment was statistically significantly greater than the value in 1982 (p values ranging from 0·043 to<0·0005), the pattern of increase was not quite as regular as among boys.

Over this short period there were also significant reductions in family size in both female and male primary school students (Table 1). This was evidenced by the 9·0% increase in girls with no siblings and the 13·5% increase in those with only one. Similar though smaller changes of 8·2% and 9·6% were seen among boys. Commensurate declines were seen among children with two or three siblings, though among the few children with four or more siblings changes were less evident. Kruskal–Wallis one-way ANOVA testing for within-sex differences in sibling numbers across the three school years suggested that while reductions in sibling numbers were statistically significant for both sexes (at an alpha level of 0·05), declines among girls were much less likely to have occurred by chance alone (p=0·00002 vs p=0·026).

When patterns of change in mean height related to numbers of sisters were compared between boys born three to four years apart, there were obvious differences. The 153 boys entering primary school in 1986 were taller and, unlike the significant 2·1–2·2 cm decline seen in mean height found between those with no sisters and those with one in the earlier period, there was a marginal increase of about 0·3 cm between these two categories in the later group. At least one point of similarity was suggested, though. The 15 and 18 boys, respectively, with two sisters were shortest, on average, in both periods. Mean statures for these boys increased, however, from 115·4 cm to 117·1 cm, between the two periods.

Discussion

These results suggest that the phenomena described in this and the previous study (Floyd, 2003) were real, but transient. Among boys born in the community in 1976

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and 1977, those without sisters were significantly taller and heavier than those with one or two, but not three or more. This was true among the 596 boys preparing to leave middle school at a mean age of 14·9 years as well as among the subset of 154 measured for the first time more than eight years before. Results of longitudinal analyses reported above for this subset support the view that most, but not all, of the mean differences in height among boys with or without sisters reflected influences acting during the pre-school years.

The pattern of weight variation was quite similar to that for height overall (see Fig. 3 and text). While the absolute differences for the two age groups were greater for weight than height, this mostly reflects the nature of the measurement. Log-transformed weight, z-score normalized within each age group, indicates similar amounts of change from boys with no sisters to boys with two for the two age groups ($-0{\cdot}369z$ vs $-0{\cdot}346z$).

The relevance of birth order was revealed through comparisons among the near majority of boys who had only one sibling. Figures 4 and 5 indicate that having an older sister was associated with significant decrements in growth relative to boys with either an older or younger brother. Data displayed also suggest that the growth of boys with a younger sister was influenced, but not to the same extent.

The parents of the 26 boys with three or more sisters were atypical. While 89% of their peers chose to limit numbers of offspring to three or fewer, these families appear to have placed particular importance on having a son. It is unlikely that these families simply had less access to contraception, or used it less effectively. Nineteen of these boys were last born in their families, most having only older sisters. It is plausible that boys in these families were taller and heavier because they received relatively more attention and care than boys with one or two sisters. This could have been both because of their status as 'only sons' and because one or more older sister was old enough to assist their mother with their care; the latter being less likely among families with fewer children given the likelihood of relatively short birth spacing that was common (Freedman *et al.*, 1994b).

Why during the mid-1970s in this particular area older sisters should have had more impact on boys' growth than other sibling categories remains difficult to explain with available evidence. It seems likely that clues will be found in the rapidly changing circumstances in this community. Fertility continued to decline in the community, consistent with results of demographic surveys in Taiwan (Freedman *et al.*, 1994a). A bias for sons as an influence in family planning decisions declined as well, the distribution of siblings becoming very similar for primary school boys and girls entering in 1986. Evidence exists for continued changes in diet during this period (Huang *et al.*, 1983; Lee *et al.*, 1991, 1992; Pan *et al.*, 1992) along with improvements in health care, housing and availability of consumer goods (Fei *et al.*, 1979; Galenson, 1979; Hermalin *et al.*, 1994). All of these factors probably contributed either directly or indirectly to the significant secular increases in mean stature among boys and girls entering primary school in the study area between 1982 and 1986 (Fig. 6). They may also have buffered boys from whatever factors had produced the decrements in growth a few years before.

Kaplan's (1996) optimizing model for human fertility and parental investment suggests a hypothesis that may be examined with additional ethnographic and

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ethological evidence from the study area. This model asserts that in a market economy where there is a growing need for skilled workers and a correlation between educational attainment and income, well-educated parents will tend to trade-off fertility for increased level of parental investment in offspring. The model also suggests that increasing investment in one area, education, would tend to increase investments in other areas as well: nutrition, health care and the like.

Circumstances in this community in Taipei fit the criteria just described quite well. In the 1960s, the Taiwanese government began instituting educational reforms oriented towards furthering industrialization. Dessus and colleagues (1995) make the point that educational investments both increased, from 2·51% of GNP in 1961 to 7·24% by 1993, and were systematically focused upon increasingly higher levels over the period. This approach, they argue, was well integrated with the transitions from labour-intensive, to capital-intensive, and then to technology-intensive industry. Enrolment rates in middle school through university continued to rise through the period with female rates outpacing those of their male peers.

Families in the Da-an district were relatively affluent. They paid high real estate values (Liu, 1982), in part to obtain educational opportunities for their children from well-respected schools in the area. More than 76% (454/596) of the parents providing information in this study had at least 12 years of formal schooling with many having advanced degrees. A virtually identical percentage (76%, 117/154) was found among families of boys with both primary and middle school records. The relationship between educational attainment and future prospects was quite clear to most parents judging from informal conversations the author has had with many families in the area. Other studies support this as well. Hou (1981) reports very strong associations between education and income, even when father's age, occupation, family origins, and public vs private sector employment have been statistically controlled. Ethnographic research in Taipei (Marsh, 1996) also supports the importance of education in determining socioeconomic status. Not too surprisingly, as in the previous study of children entering primary school (Floyd, 2003), analyses in the present study also revealed parental education level to be highly significantly associated with stature as children prepared to leave middle school ($p<0·0005$).

It may be hypothesized that parents, or other care-givers, within the study area may have placed a great deal of importance on characteristics suggestive of later educational achievement. If daughters were more often perceived to embody these characteristics, given their earlier language acquisition for example, then levels of investment in them may have been proportionately greater than in a following son, despite the traditional preference for sons. Care-givers' behaviour may, too, have been influenced by awareness of a more egalitarian ethos and recognition of increasing opportunities for their daughters. Mothers among several families in the study area interviewed recently commented that while a son is desired, the ideal family consists of a daughter and son, born in that order. Who the care-giver was – whether they were the mother or a grandmother for example – could also have made a difference (Waldmann *et al.*, 1977). These circumstances may have differentially influenced the environments that later boys were being born into.

A professor of psychology in Taiwan Normal University suggested that differences in early childhood behaviour may not be sufficient as an explanation (Tsai

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Shung-Liang, personal communication). He suggested that among such a relatively well-educated group, parents might have invested more heavily in daughters precisely because they would be expected to marry and join another family. Such an investment in a daughter would be the primary means of investing in grandchildren because it would increase her prospects for a good marriage. This is also consistent with Kaplan's model and does not exclude the possibility of earlier behavioural cues influencing patterns of investment.

If the differences in stature detected among the boys born in 1976 or 1977 were related to interactions between changing parental attitudes and behaviour, socio-economic circumstances and greater inherent male sensitivity, then increases in disposable income and improvements in health care available to later cohorts might reasonably be expected to diminish the impact of these interactions. With absolute increases in family resources, the ability for marginal investment in a second or third offspring would increase so that similar behavioural circumstances would have different impacts on later cohorts of boys. These circumstances may still be amenable to anthropological investigation.

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