

Reliability of infant length measurement

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Abstract

The reliability of length measurement was determined in 38 infants less than 1 year of age. The SD of a single length measurement was 0.28 cm at birth and 0.42 cm both at 6 weeks and at 8 months of age, comparable with the SD of a single height measurement in previously reported older children. There is no technical reason to prevent reliable measurement of young infants.

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Short stature is frequently identified by screening height in a particular age group, typically around 5 years of age at school entry. Routine measurement of height or length of the preschool child is rarely undertaken, probably due to perceived difficulties with the reliability of measurement. Currently measuring the length of infants less than 1 year of age has not been recommended.¹ We determined the reliability of length measurement in infants less than 1 year of age, specifically targeting the ages when infants are generally screened for other variables in child health surveillance programmes.

Subjects and methods

Thirty eight infants less than 1 year of age were studied: 12 term newborn infants less than 48 hours of age were measured on the postnatal ward, 15 infants attending for their routine 6 week check (mean age 7.4 weeks) and 11 infants attending for their 8 month check (mean age 8.2 months) were measured at their local community clinic.

The infants were measured by two observers on two instruments, a conventional measuring mat with marked 0.5 cm increments (Starters, Norwich) and a Raven Rollametre marked in

0.1 cm increments (Raven, Great Dunmow). Measurements using the measuring mat were approximated to the nearest 0.25 cm. Each infant was measured three times by the same two observers on both the measuring instruments, that is a total of 12 measurements per child. For each measurement one observer, the holder, positioned the infant's head flush against the headboard while the other observer, the measurer, held the infant's legs flat as the foot board was positioned against the infant's heels. The footboard was positioned without reference to previous measurements, and the measurement read and recorded by the holder. In this manner the measurer was blind to previous measurements. The order of measurement was by random allocation. Permission for the study was obtained from the ethics committee of the Southampton University teaching hospitals. The parents gave informed written consent.

Results

The mean measurements at all three age group by observer and instrument are given in table 1. For the newborn babies there was a highly significant ($p < 0.01$) difference between the mean measurements of the two instruments, but there was no significant difference between the SD of single length measurement (SDslm) for the two instruments at any of the three ages, and so a pooled value has been given for each age (table 2). In the 6 week old infants there was a highly significant difference between the means of the two observers ($p < 0.01$). The measuring was well tolerated but all children cried by the end of the 12 measurements.

Discussion

The SDslm in infants less than 1 year of age is comparable with the SD of a single height measurement (SDshm) in older children previously reported (table 1).² The SDslm of the older infants is greater than the SDslm of newborns probably because they struggled more forcefully against measurement. The SDslm for the newborn is very similar to that for much older schoolchildren measured using a stadiometer.³ The SDslm of the 6 week and

Table 1 Mean length measurement of infants at three ages segregated by observer and instrument

Age group of infant	No of measurements	Mean measurement (cm)	SE of difference (cm)
Newborn infants			
Observer 1	72	51.026	
Observer 2	72	51.065	0.0463
Measuring mat	72	51.184	
Rollametre	72	59.907	0.0463
6 Week infants			
Observer 1	90	57.240	
Observer 2	90	57.447	0.0630
Measuring mat	90	57.316	
Rollametre	90	57.371	0.0630
8 Month infants			
Observer 1	66	68.295	
Observer 2	66	68.258	0.0724
Measuring mat	66	68.280	
Rollametre	66	68.273	0.0724

Table 2 SD of single length or height measurement in normal children at different ages

Age group	SD of single measurement (cm)
Newborn length	0.28
6 Week length	0.42
8 Month length	0.42
19-23 Month height	0.55
3 Year height	0.23
4-11 Year height	0.23

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8 month old infants is very similar to that for 19 to 23 month old children,² who may also resist being measured. Although the SDslm at 6 weeks and 8 months is greater than the SDshm in older children, this increase is less consequential because growth velocity is greatest in the first year averaging 20 cm, so significant impairment in growth would still be detectable. There was a significant difference in the mean measured lengths between the two observers at 6 weeks, emphasising the ideal of a single observer recording serial measurements in individual children.

The imprecision of any single measurement is magnified when two serial measurements are used to generate height velocity.⁴ This imprecision is negated by increasing the duration and number of measurements. Measurement of length should be instituted as young as possible, and a single observer should record serial measurements in individual children. Although two doctors measured the infants, this was to ensure blind technique rather than specific requirement. Measurement could easily be performed by one

observer using the parent as the holder.

There was no significant difference in the reproducibility of the two measuring instruments, echoing previous findings in older children that the major source of error is in the child's posture.² Despite its relative unsophistication the measuring mat was effective, but both observers greatly preferred the Rollametre's ease and acceptability. All the children in our study struggled at some time during the measurements so we feel that our findings are realistic and applicable. The instruments used are portable, cheap, and readily used in a community setting. There is no technical reason to prevent reliable measurement of young infants, and therefore it should be encouraged.

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