

## Objective confirmation of crying durations in infants referred for excessive crying

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### Abstract

Parents commonly seek clinicians' help for infant crying that they judge to be excessive. To date there is no independent evidence whether such babies actually cry more than average. To assess this, maternal diary and 24 hour audiotape recordings of the crying periods of 16 infants referred for excessive crying were compared with equivalent measures of a normative sample. The overall amounts of crying measured by the two methods were similar. The referred infants cried substantially more over 24 hours and in the afternoon and evening. The difference approached significance in the morning but was insignificant at night time. Some qualifications to the findings are indicated.

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Parents commonly seek clinicians' help for infant crying that they judge to be excessive.<sup>1</sup> The exact rate of such approaches depends partly on the services available, but prevalences of around 20% have been reported.<sup>2</sup> The crying has been linked to maternal distress, family disturbance, and child abuse.<sup>3,4</sup> The phenomenon is therefore a significant and costly one for primary health services.

Surprisingly few systematic studies exist of infants' actual amounts of crying. The picture has begun to improve with the publication of figures from community<sup>2,5</sup> and referred samples.<sup>2,6</sup> These figures suggest that parents who refer babies may be correct in judging that their babies cry a lot; the levels reported for referred cases are substantially above the community average. An important proviso is that all the figures to date have been provided by mothers, using diaries or questionnaires. Only two studies based solely on small community samples (n=10) have attempted to measure infant crying levels directly.<sup>7,8</sup> Both studies found substantially lower levels of crying than that reported by mothers. Barr *et al* obtained an overall correlation of 0.64 between tape recordings and maternal diary records, but individual mothers were found to be particularly unreliable.<sup>7</sup> Given the lack of objective, non-maternal evidence that infants referred for excessive crying actually cry more, the aim in the present study was to compare the diary and tape recorded crying measures of a group of referred infants with those obtained from a normative sample.

### Subjects

Infants referred by their mothers to health

professionals for excessive crying ('referred infants') were recruited in two ways. Within a longitudinal, community study of crying from birth, 14 mothers (15% of the community sample) sought health visitor or general practitioner help for excessive crying by 6 weeks of age, a rate similar to that of other studies.<sup>2</sup> In six cases, it was possible to contact the mothers immediately to obtain diary and audiotape measures when the infants were 6-7 weeks of age. Health visitors familiar with the study identified 10 further cases where mothers had sought their help for excessive infant crying. The mean age of the combined infant sample (n=16) was 7.7 weeks.

Comparison (control) infants were drawn at random from the longitudinal community sample. Within the first 10 postnatal days, researchers unaware of the infants' crying levels asked 23 mothers for permission to tape record their babies' crying in their homes. Complete diaries and audio recordings at 6 weeks were obtained for 16 infants (mean age 6.3 weeks).

Eight control and nine referred infants were boys. Thirteen and 12, respectively, were firstborns. When assessed, 10 in each group were breast feeding, four were bottle feeding, and two were breast and bottle feeding. Both groups were mixed in social class. None of the infants was prematurely born or had an established illness and all were gaining weight normally. The age of 6 weeks was targeted for the study because crying peaks around this time,<sup>9,11</sup> and to enable comparison with the findings of Barr *et al*.<sup>7</sup>

### Methods

The mothers completed 24 hour diaries of infant crying and other behaviour based on those used by Barr *et al*.<sup>7</sup> The diaries resemble time rulers, so that periods of crying, fussing, awake-content, feeding, and sleeping behaviour are shaded in as they occur against a timescale, with a resolution of five minutes. Crying was defined as 'periods of prolonged distressed vocalisation', while fussing was recorded where 'your baby is unsettled, irritable, restless or fractious and may be vocalising, but not continuously crying'.

During the same 24 hour period, each infant's vocalisations were recorded continuously using calibrated radio microphones and voice operated tape recorders. The control circuitry included an electronic 'speaking clock' which recorded the onset time of each vocalisation and audible clicks at one second intervals throughout the vocalisation on the second audiotape channel.

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The time of day and duration in seconds of each vocalisation were therefore recorded precisely. The audiotapes were later transcribed by trained researchers using written definitions to identify fussing and crying. Intertranscriber agreement was examined for 20% of the audiotapes of each group. A more detailed account of the recording and transcription methods will be given elsewhere (manuscript in preparation). The procedures followed were approved by the ethical committees of the participating hospitals.

## Results

As the distinction between more intense 'crying' and less intense 'fussing' is an exploratory one, the data were collapsed into the single conventional category of crying.<sup>9</sup> The validity of the fussing/crying distinction will be evaluated elsewhere (manuscript in preparation). Following others,<sup>7</sup> individual periods of crying recorded in the diary, ranging from five minutes upwards in length, were totalled within each time of the day: morning (6am-noon), afternoon (noon-6pm), evening (6pm-midnight), and night (midnight-6am). Similar crying periods were readily discernible on the audiotape transcription records. To ensure uniformity across methods and infants, a five minute 'moving window' was used to code the transcribed crying. Where 15 seconds or less of crying occurred within a five minute segment, the crying was regarded as an isolated instance and disregarded. Where 20 seconds or more occurred, the window was moved until a continuous five minute segment without crying was found, signifying the end of a crying period. The lengths of such crying periods within the morning, afternoon, evening, and night were then totalled, as for the diary. A comparison of alternative coding methods will be presented elsewhere (manuscript in preparation). Advantages of the present method are that it recognises the inherently punctuated nature of cry vocalisation, generates crying levels closely matching those perceived by parents, and is highly reliable. Five audiotapes (three control and two referred) were transcribed and coded independently by two researchers, as well as two further tapes by the same researcher at an interval of a month. Inter-researcher and intraresearcher agreement on the audiotape 24 hour crying period total was exact in each case.

The number of minutes of crying at each time of the day in referred and control infants is shown for each of the methods in the table. Except for the night time, the mean crying durations for the referred infants were consistently and substantially higher than those of the control infants. To confirm this, two way

analysis of variance was computed, with group difference (control:referred) as an independent variable and method (audiotape:diary) as a repeated measure. A significant group difference in 24 hour crying totals was shown ( $F=9.73$ ,  $df_{30; 1}$ ;  $p=0.004$ ) with no method effect ( $F=0.31$ ,  $df_1$ ;  $p=0.203$ ) or interaction of method with group ( $F=0.31$ ,  $df_1$ ;  $p=0.584$ ). Separate group comparisons for each time of day confirmed the lack of a group difference at night time, while the difference bordered on statistical significance at other times. As shown in the table the lack of statistical significance at particular times of day is attributable to the high standard deviations within the group, possibly due to the limitations of single assessments and small sample sizes. The group difference for the afternoon and evening combined was, however, significant ( $F=5.80$ ,  $df_{30; 1}$ ;  $p=0.022$ ) for both methods ( $F=2.27$ ,  $df_1$ ;  $p=0.143$ ) and without a significant interaction between method and group ( $F=0.02$ ,  $df_1$ ;  $p=0.885$ ). The group difference in combined morning and night time crying bordered on statistical significance ( $F=3.38$ ,  $df_{30; 1}$ ;  $p=0.076$ ), again without a significant method difference ( $F=0.09$ ,  $df_1$ ;  $p=0.765$ ), or a significant interaction between the measurement method and group ( $F=1.14$ ,  $df_1$ ;  $p=0.293$ ).

## Discussion

This study compared audio recorded and diary measures of crying durations of infants referred for excessive crying with durations in a normative sample. The comparison was carried out at 6–7 weeks of age, when crying in infants is at its peak.<sup>9, 10</sup> Both the 24 hour crying totals for the referred infants (3¼–3¾ hours) and community infants (2¼–2½ hours) were comparable with the diary levels reported by other studies for equivalent groups.<sup>5, 6, 12</sup> Both groups also showed the afternoon and evening clustering of crying common at this age.<sup>2, 9–12</sup>

The results from both methods showed substantially and significantly raised 24 hour and afternoon/evening crying totals in the referred infants. The difference in the morning bordered statistical significance, but night time totals did not differ. Broadly speaking, this picture is consistent with the findings of a previous, maternal questionnaire study, which found raised median crying totals in referred infants at this age in the morning, afternoon, and evening, but not night time.<sup>2</sup>

These findings provide the first objective, tape recorded evidence that mothers who seek advice from professionals for infants' excessive crying are correct in believing that their babies cry substantially more than average. There are two provisos: firstly the findings refer to group measures and both the present and an earlier community study found individual mothers whose diaries bore little resemblance to the concurrent audiotapes.<sup>7</sup> This seems to apply to mothers generally, however, rather than to referring mothers in particular. Secondly, the reported crying figures relate to overall periods of crying and fretful behaviour, as defined here. Although group differences are unaffected, the

Maternal diary versus audiotape measures of the number of minutes of crying in referred ( $n=16$ ) and control infants ( $n=16$ ). Results are mean (SD)

	Referred infants		Control infants	
	Diary	Audio recording	Diary	Audio recording
Morning (6am-noon)	38 (32)	48 (37)	27 (22)	25 (22)
Afternoon (noon-6pm)	68 (36)	83 (42)	42 (29)	57 (31)
Evening (6pm-midnight)	75 (46)	79 (38)	46 (39)	49 (28)
Night (midnight-6am)	16 (24)	20 (24)	21 (20)	18 (17)
24 Hour total	197 (65)	230 (74)	136 (54)	149 (67)

amount of crying measured depends on how it is defined,<sup>6 13</sup> and differences of definition probably account for the shorter lengths of crying recorded by audiotapes than diaries in community studies.<sup>7 8</sup> Definitions acknowledging intensity and other qualitative features of crying may show that referred infants differ in their type as well as the amount of crying. These issues will be analysed elsewhere (manuscript in preparation).

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