

Developmental Retardation in Infants as a Concomitant of Physical Child Abuse¹

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The impact of child abuse on the developmental functioning of infants was investigated. Thirty verified cases of physically abused children were compared to a reference group of 30 nonabused children matched for age, sex, race, and socio-economic status. Abused children scored significantly lower in terms of cognitive and motor development as measured by the Bayley Scales of Infant Development. Developmental delays on three of the four sectors of the Denver Developmental Screening Test, personal-social, language, and gross motor, were also found in the abused children. There were, however, relatively few item differences between the two groups on the 30 more general behavioral variables constituting the Bayley Infant Behavior Record. Results appear to confirm clinical observation of abused children as developmentally retarded with specific delays in the language and gross motor areas. Although methodologically complex, longitudinal studies are clearly indicated to assess the stability and/or reversibility of the present findings.

The primary focus of the literature in the area of child abuse has been the adults involved: their demographic characteristics, psychological functioning, and treatment approaches aimed at modifying their abusive behaviors. Consequently, our present knowledge of the abused child is limited mostly to clinical observations and theorizing. Specifically, little is known of the immediate or long-range consequences of abuse as they are manifest in the child's behavior.

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While several authors have suggested that one of the consequences of abuse may be impaired cognitive development and retarded intellectual functioning, few studies have directly attempted to investigate this relationship (Brandwein, 1973). Some retrospective studies (e.g., Morse, Sahler, & Friedman, 1970) have reported a high incidence of retarded functioning among abused children upon follow-up. These studies, however, suffer from the methodological problems of high attrition rates and lack of inclusion of control samples. In the only well-controlled study available, Sandgrund, Gaines, and Green (1974), employing a matched control group, found significantly lower intellectual functioning in abused and neglected 8½-year-olds. They also found a higher percentage of retardation in the abused and neglected groups as defined by Wechsler IQs below 70.

Since a number of studies summarized by Helfer and Kempe (1974) indicate that the majority of abused children are under 3 years of age, the present study is an attempt to investigate the impact of child abuse on developmental functioning in the young child. The specific hypothesis to be tested is that abused children under 2½ years of age will be developmentally retarded in comparison to their nonabused peers, while the hypothesis to be disproved would be that the two groups do not differ in level of developmental attainment.

METHOD

Subjects

Sixty children, 30 abused and 30 nonabused controls matched for age, sex, race and socioeconomic status, were evaluated. All abused children were current cases actively being followed by the Child and Family Protective Services Treatment Program, University of Texas Medical Branch, Galveston. The diagnosis of abuse was made by this agency. The nonabused control children were obtained from the Pediatric Outpatient Clinic.

Criteria for classifying children as abused were a diagnosis of significant nonaccidental trauma by the examining pediatrician as well as confirmation by investigation of the relevant child welfare agency. While several children were diagnosed as having multiplenary injury, the modal injury was bruises followed by fractures, burns, and lacerations. Children known to have suffered severe head trauma were excluded from the sample. Also, children whose injury was secondary to the parents' failure to provide adequate care or supervision (neglect) were excluded, as were children who carried a diagnosis of nonorganic failure to thrive.

All children were between the ages of 2 mos. and 29.83 mos. with an average age of 14.66 mos. The mean age of the experimental group children and the

control group children was 15.78 mos. ($SD = 8.81$) and 13.55 mos. ($SD = 8.49$), respectively. This difference was not statistically significant, $t(58) = 1.00$. The two groups were composed of an equal number of males and females. Five (16%) of the abused children and seven (23%) of the control children were black. Both groups consisted of an equal number of children above and below 12 mos. of age.

All children studied came from homes where the head of the household met Hollingshead's (Note 1) criteria for categories IV and V of the two-factor index of social position. Mean total years of education for the abused and non-abused groups were 11.13 ($SD = 2.30$) and 10.05 ($SD = 2.21$), respectively, with 20 being the highest ranking possible; average occupational rankings were 6.0 ($SD = .95$) and 5.47 ($SD = 1.31$), respectively, with 7 being the lowest ranking possible. The mean age of the mothers and number of children under 18 in the family were 22.35 yrs. ($SD = 3.18$) and 2.04 ($SD = 1.04$) for the abused and 24.80 yrs. ($SD = 4.64$) and 2.00 ($SD = .96$) for the nonabused groups, respectively. All mean differences between groups were nonsignificant.

Materials and Procedure

The Bayley Scales of Infant Development (Bayley, 1969) and the Revised Denver Developmental Screening Test (Frankenburg, Dodds, & Fandal, 1970) were administered to each child in a counterbalanced order so that half of the infants received the Bayley Scales first and the other half received the Denver first. All 60 children were evaluated by the same experienced examiner who performed the evaluation in a "blind" fashion with no information as to the child's history available. Both the Bayley Mental and Psychomotor Scales were administered. Also, the Bayley Infant Behavior Record (Bayley, 1969) based only upon behaviors observed during testing was completed by the examiner immediately after each evaluation.

All measures were administered and scored as instructed in the respective test manuals (Bayley, 1969; Frankenburg et al., 1970). In addition, Denver mental age scores were calculated for each of the four sectors (personal-social, fine motor-adaptive, language, and gross motor) using the 50% pass method (Frankenburg, Camp, & Van Natta, 1971). The four sectors were also averaged to obtain a mental age score for the total Denver, and developmental quotients derived by the formula of mental age/chronological age \times 100 were computed (Frankenburg, Camp, Van Natta, Demersseman, & Voorhees, 1971).

RESULTS AND DISCUSSION

The data were analyzed by means of a three-way factorial multivariate analysis of variance with abuse, sex, and race as between-groups factors and age

Table I. Means and Standard Deviations for Abused and Nonabused Children on Nine Dependent Measures

Measure	Abused children		Nonabused children	
	Mean	SD	Mean	SD
Bayley				
Mental Development Index	75.07 (74.68) ^a	18.92	106.00 (104.56)	18.94
Age equivalent	12.03 (10.54)	7.26	13.48 (14.26)	7.89
Psychomotor Development Index	85.53 (83.70)	23.60	125.93 (125.86)	15.15
Age equivalent	13.19 (11.28)	7.66	16.14 (17.58)	9.76
Denver Mental Ages				
Personal-social	13.14 (12.69)	8.93	13.69 (14.75)	8.63
Fine motor-adaptive	11.19 (10.79)	5.67	10.85 (11.45)	5.85
Language	9.13 (8.90)	6.99	10.91 (11.84)	6.43
Gross motor	11.80 (11.12)	7.98	13.21 (14.22)	8.16
Denver Developmental Quotient	72.29 (77.11)	14.74	93.03 (92.02)	11.05

^aCovariate adjusted means.

partialed out as a linear covariate (Overall & Klett, 1972). Since the two groups were not precisely matched on age, the covariance analysis was employed to control for the effects of this variable. Main effects of race and sex and the interactions of these factors with each other and with abuse were all negligible. The main effects of abuse revealed significant differences for eight of the nine dependent measures; all interactions involving abuse and other variables were non-significant. Table I presents means and standard deviations for the two groups of children studied.

Bayley

On the Bayley Mental Scale the difference in the magnitude of the scores between the two groups was highly significant, $F(1, 51) = 29.19, p < .001$, with the abused children attaining a mean Mental Development Index significantly below that attained by the nonabused control children. The same disparity in functioning was reflected in the Mental Scale Age Equivalent scores, $F(1, 51) = 20.39, p < .001$, with the abused children performing on the average approximately 4 months below the nonabused controls. Similar results were obtained with reference to the Bayley Motor Scale (see Table I), with the abused children yielding scores significantly smaller in magnitude than the nonabused controls, $F(1, 51) = 46.06, p < .001$. Again, the same difference is reflected in the Motor Scale Age Equivalent scores, $F(1, 51) = 37.71, p < .001$, with the abused children performing on the average 5 to 6 months below the nonabused controls.

The nonabused control children obtained Bayley Mental Scale scores generally consistent with but somewhat higher than normative expectations

(mean Mental Development Index = 106.00), while the same children obtained Bayley Motor Scale scores that were significantly above normative expectations (mean Psychomotor Development Index = 125.86). The present results on the basis of the Mental Development Index parallel other findings on similar populations at this age level (King & Seegmiller, 1973). Although mental test performance generally has not been shown to be related to socioeconomic status before 15 months of age, psychomotor test performance has been shown to be related to this variable. Several authors (e.g., Bayley, 1965) have reported a "generalized motoric precocity" in lower socioeconomic status black infants that tends to diminish with increasing age. Since the present findings are based on a primarily white sample and the main effects of race were negligible, the data would seem to imply that the observed motoric precocity may be a function of socioeconomic status rather than racial variables. This conclusion is consistent with the findings of Williams and Scott (1953).

Denver

The performance of the two groups of children on the Revised Denver Developmental Screening Test generally parallels their performance on the Bayley. In terms of Denver nominal classification, all of the nonabused children were classified as "normal," while 53%, 30%, and 17% of the abused children were classified as "normal," "questionable," and "abnormal," respectively. Mental age levels obtained by the abused children (see Table I) were significantly lower in magnitude in three of the four Denver sectors, personal-social, $F(1, 51) = 4.87, p < .05$; language, $F(1, 51) = 6.60, p < .05$; and gross motor, $F(1, 51) = 11.04, p < .001$. Mental age levels were not significantly different between the two groups in the fine motor-adaptive sector, $F(1, 51) = 1.25, n.s.$ As would be expected from the sector mental age levels, developmental quotients were significantly different in magnitude between the two groups, $F(1, 51) = 15.91, p < .001$. It is noteworthy that of the four sectors, gross motor yielded the most discrepant mental age levels and was also one of the Bayley Infant Behavior Record items (see below) that was rated as significantly lower in the abused children. These findings would seem to confirm the observation (Kempe, Note 2) that along with language, delayed or retarded gross motor development is one of the most consistently mentioned characteristics of abused children on the basis of clinical observation.

Infant Behavior Record

The findings with reference to more general behavioral variables as assessed by the Infant Behavior Record are less decisive than for either the Bayley Mental and Motor Scales or the Denver. There were relatively few item differences between the two groups on the 30 variables constituting this measure. Abused

children showed more persistent object attachment, $F(1, 51) = 7.01, p < .05$, a behavior generally associated with younger children. Abused children also showed less endurance in terms of behavior constancy in adequacy of response to the demands of the tests, $F(1, 51) = 4.12, p < .05$, and during testing demonstrated poorer gross motor coordination than the controls, $F(1, 51) = 7.35, p < .01$. In addition, general evaluation of abused children was less favorable, with many more being classified as exceptional, $F(1, 51) = 23.68, p < .001$.

CONCLUSIONS

These data appear to indicate that differences in the developmental functioning of abused children can be detected as early as 4 months of age. The youngest group of physically abused children differ from their nonabused peers on several measures of cognitive and psychomotor development. They were generally not, however, judged as otherwise behaviorally deviant. The implication of the present findings for clinical management seems clear. Specifically, assessment of the child's total developmental progress is always relevant because inflicted injuries may be only one component of the child's situation.

It has been suggested (Brandwein, 1973; Martin, Beezley, Conway, & Kempe, 1974) that the observed relationship between physical abuse and retarded intellectual functioning may be secondary to head trauma. While such an etiological relationship may be valid in certain situations, it does not appear to be a very plausible explanation for the present results. Children known to have suffered severe head trauma were excluded from study. Also, while the possibility of preexisting significant developmental abnormalities cannot be ruled out, this may be the case only infrequently (Martin & Beezley, 1974). Parenting behavior may be a more plausible explanation. This would include both the frequently described lack of bonding and limited child-rearing skills of many abusing parents (Ounsted, Oppenheimer, & Lindsay, 1974; Pollock & Steele, 1972) as well as the aspect of general neglect often felt to accompany physical abuse (Sandgrund et al., 1974).

While the longitudinal stability of the present findings is difficult to assess, retrospective studies of older abused children tend to corroborate the present results. Although there are many methodological problems, longitudinal studies are clearly indicated. Above all, perhaps the most important issue concerns the reversibility of the observed developmental deviancy in abused children. Effectiveness of parental treatment and consequent changes in child-rearing practices and attitudinal patterns, the availability of alternate living environments, and remedial educational/stimulation experiences would all be meaningful variables for study in conjunction with longitudinal study of the child.

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