

A study of the relationship of ninety background, developmental, behavioural and medical factors to childhood accidents

A report from the Dunedin Multidisciplinary Child Development Study

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ABSTRACT. A sample of 991 five-year-old children was divided into three groups on the basis of accidental injuries they had received in their first five years of life. Group one (N = 505) had had no accidents, group two (N = 326) had had one accident and group three (N = 160) had had two or more accidents. The groups were then compared on ninety background, developmental behavioural, and medical measures. No consistent differences between the three groups were identified. It is argued that attempts to identify those more liable to accidents lack utility and have an inhibitory effect on accident prevention. In view of this, it is advocated that future accident research should concentrate on identifying unsafe aspects of the environment.

The relationship of background, developmental, behavioural, and medical variables to childhood accidents has received very little attention in New Zealand. Most of the child accident research has been concerned with poisonings and the examination of correlates within these studies has, with one notable exception¹ been largely confined to a few of the more commonly investigated variables, such as race and sex².

Shaw¹ described 50 preschool children who had been poisoned, together with 50 controls. Questions were asked about the circumstantial history of the poisoning accident and the history of past accidents. Parents were also asked about their family, personal, and medical histories, including past accidents. Mothers completed the Parental Attitude Research Instrument³, the Cornell Medical Questionnaire⁴, and a Parental Role Definition Research Instrument⁵. The children's intelligence was assessed with the Stanford-Binet Intelligence Test⁶, and eating habits were also assessed. In his summary, Shaw stated

"Seven at risk factors make a child more likely to ingest toxic substance. These are greater accommodation changes by the family, father having had a large number of jobs, paternal past history of accidents, child's exploring ability, child's past history of poisonings, an abnormal appetite in children" (p. 269)

Only one New Zealand study⁷ has reported an investigation of some correlates of all types of accidents. This study of accidents in the first three years of life showed that there were no significant sex differences between children who had accidents and those who did not.

Children were grouped according to whether they had had no accidents, one accident, or two or more accidents. Measures of the mother's general ability and training in child development and of the child's intelligence were compared. There were no statistically significant differences between any of the groups on any of the measures.

Few of the large number of overseas studies of accidents among young children have examined in detail relationships between background, developmental, behavioural, and medical factors to child accidents. Those studies that have discussed the problem have focussed on specific types of accidents and examined a limited range of variables such as poisonings.^{8,9,10} A small number of studies have examined all child accidents but, typically, the range of associated variables studied has been limited and/or the number of cases examined small.^{11,12,13,14} One notable exception to this was the study undertaken by Manheimer and Mellinger.¹⁵ From a population of 8874 boys and girls aged 4 to 18 years, they selected 684 children to represent "high", "intermediate", or "low" accident liability children, based on records of medically attended injuries. Information was collected on psychological and physical characteristics of the child by interviewing the mother. Behavioural characteristics were checked with those given by the child's teacher. The results showed that there was a statistically significant relationship between accident liability and indices of extroversion, daring, roughhousing and other traits likely to expose children to hazards. Similar relations held for traits such as poor discipline and aggressiveness towards peers which, it was argued, compete with the child's ability to cope with hazards.

The underlying assumption in studies such as that of Manheimer and Mellinger¹⁵ is that the child who has accidents is, in some way, different, whether it be physically, socially, or psychologically, from the child who has no accidents at all.

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The present study represents an examination of the issue as to whether children who have accidents differ significantly from those who do not. It is an extension of an earlier Dunedin study⁷ as it reports on associations between a wider range of variables and child accidents over the first five years of life.

METHOD

The sample, subjects in a longitudinal study of child development, consisted of 991 five-year-old children drawn from all surviving metropolitan infants who were born at Dunedin's one maternity hospital (Queen Mary) between 1 April 1972 and 31 March 1973. The sample has been described in detail elsewhere.^{16,17}

The children's parents supplied information on all accidents experienced by the children during the first five years of life which resulted in medical attention being sought from a doctor. On the basis of this information children were divided into three groups as follows: no accidents, one accident only, and two or more accidents. The groups were then compared on ninety background, developmental, behavioural, and medical variables to see whether the groups differed significantly. The measures are briefly described below, and more detailed descriptions of these are available elsewhere.^{16,17} The measures were taken when the children were three years of age (Phase III) and five years of age (Phase V).

The results were analysed using analysis of variance or Chi square, depending on whether the variables were normally distributed. For Chi square, adjacent cells were combined where expected frequencies did not meet the criteria as laid down by Cochran.¹⁸

BACKGROUND MEASURES

Socio-economic Status

The mother was asked to describe the father's occupation and this was converted into a socio-economic level using the Elley and Irving¹⁹ six-point classification based on New Zealand census data.

Parents' Education

Details on two aspects of each parent's education were obtained at Phase III. A question was asked about the extent of formal education which varied from primary education to tertiary education. A second question ascertained the highest formal educational qualification of each parent.

Maternal Training in Child Development

Five levels of training in child development were assigned to mothers as a result of a question in Phase III which asked how the mother had learned about bringing up children.²⁰

Mothers' General Mental Ability

The SRA Verbal Form²¹ was administered to the mothers in Phase III to assess their general mental ability.

Marriage Situation

At Phase V mothers were asked if there had been any changes in their marriage situation over the previous two-year period.

Family Mobility

This was assessed at Phase III by asking how many times the child had had a change of address. This provided a measure of the number of shifts experienced by the family in three years.

Experiences and Activities

Experiences and activities were sampled by a 30 item experiences checklist and a 30 item activities checklist.¹⁶ Typical of the items on the Experiences Scale were: Has . . . been to a concert, factory, museum? The Activities Scale had items such as: Does . . . climb trees, fences, colour in, and play ball games? Total scores were computed for each scale. Both scales were administered at Phases III and V.

DEVELOPMENTAL MEASURES

Motor Co-ordination

Motor co-ordination was assessed at Phase III using a modification of the Bayley Scales²² and again at Phase V by the McCarthy Motor Scales.²³

Language Development

At Phase III and V, language development was assessed using the Reynell Developmental Language Scales.²⁴ Mothers were also asked if the child had been referred to a specialist for speech or language problems.

Weight, Height, and Head Circumference

Weight, height, and head circumference were measured at Phases III and V.

Child's IQ

The child's IQ was measured with the Stanford-Binet Intelligence Scale⁶ during Phase V.

BEHAVIOUR MEASURES

Behaviour Profiles

The American Collaborative Study Protocols²⁵ for rating behaviour was used to evaluate the qualitative and quantitative aspects of a child's behaviour during psychological assessment. This was used at both Phases III and V. The Behaviour Profile consists of 15 dimensions, each of which are on a five-point scale.

Rutter Parent Questionnaire

Mothers were asked to fill in Part 3 of the Rutter Parent Questionnaire²⁶ at Phase V. This questionnaire includes items relating to 18 behaviour problems in the home during the year preceding assessment.

Naughtiness

Mothers were asked "How many times yesterday was . . . rude, obstinate/disobedient, destructive, etc. at Phase V. Eleven items were scored and the frequencies added to give a figure which was described as the "Total Naughtiness" Score.

Management Problems

Mothers were asked in Phases III and V whether their child was or was not "very difficult to manage".

General Behaviour Problems

Finally, in Phase V mothers were asked if specialist advice had been sought for any behaviour problems.

MEDICAL MEASURES

Neurological Abnormalities

An examination of neurological functioning was carried out at Phase III. This involved an examination for any spontaneous motility, assessed range of passive movements, and resistance to passive movements. Also elicited were ankle, knee, biceps, plantar, foot grasp, and palmo-mental reflexes. Tests of finger tip touching, observation for any involuntary movements, and examination of the face for asymmetry were also included. Posture of the feet and the child's gait were also

observed.²⁷ Eyes were examined to determine the presence of a manifest squint and the Parr cover test²⁸ was carried out to see whether there was a latent squint. The neurological examination resulted in the assignment of a "neurological score" which was simply the number of signs of neurological dysfunction observed.

Enuresis

When the child was five mothers were asked "During the last month has . . . usually been dry in the morning?" (3 out of 4 days) and "During the last 4 mornings how many times has . . . been wet?" Enuresis was defined as wetting the bed 75% or more nights.

Sleeping and Eating Problems

Sleeping and eating problems were assessed at Phase V by asking "Does . . . usually have sleeping problems?" and "Did you have any problems feeding . . . yesterday?"

Otological Abnormalities

At Phase V pure tone audiometry tests were carried out by an audiometrist. Children were classified according to their hearing loss in decibels. For analysis, average pure tone hearing levels were compared.

Vision

The Sheridan Gardner Test²⁹ was administered at Phase V. Children who scored 6/9 or worse in either eye were classified as suspect.

Other Illnesses

The mothers were asked at Phase V to report if they had referred their child to a specialist for a variety of problems. Included in the list were some which might be considered psychosomatic, namely, asthma and allergy.

RESULTS

Five hundred and five of the children had not had an accident, 326 had had only one accident, and 160 had had two or more accidents. The accidents and resulting injuries are described in detail elsewhere.³⁰

Sex: There were no significant differences in the percentages of males and females in the three accident groups.

Background and Developmental Variables

The accident groups did not differ significantly from one another on any of the background or developmental variables.

Behaviour Variables

Two of the Behaviour Profile variables observed at Phase III and one at Phase V showed significant differences between the groups. The variable, the phase at which they were measured, and significance levels were as follows:

Emotional Reactivity (Phase III) (χ^2 13.37 4 df $p < .01$)

Nature of Activity (Phase III) (χ^2 16.39 4 df $p < .01$)

Attention Span (Phase V) (χ^2 16.18 6 df $p < .05$)

The only Rutter behaviour item to show a significant difference between the accident groups related to disobedience. The trend was for a disproportionate number of those children in the "certainly applies" category to be in the high accident group ($\chi^2 = 11.48$ 4 df $p < .05$).

In contrast to this result was the finding that the accident groups' mean total Naughtiness scores were not significantly different.

Finally, slightly more of the children whose mothers said (at Phase V) that they were "difficult to manage" were in the high accident group ($\chi^2 = 6.66$ 2 df $p < .05$).

Medical Variables

History of allergy was the only medical variable to result in a significantly different occurrence between the accident

groups. Those children with a history of allergy were over-represented in the high accident groups ($\chi^2 = 8.19$ 2 df $p < .05$).

DISCUSSION

Of the 90 comparisons made, only 6 revealed significant differences. This is one more than would be expected by chance at the 0.05 level.³¹ That these were chance findings is supported by the lack of consistency in the results. "Emotional Reactivity", "Nature of Activity" and "Attention Span" showed significant differences between the groups at one of the phases but not at the other. Mothers reports of whether their child was "difficult to manage" also failed significantly to discriminate between the groups in both phases. Although the Rutter item relating to disobedience significantly differentiated between the groups, mean total "naughtiness scores" did not.

Similar inconsistencies were evident in the Manheimer¹⁵ results. For instance, the activity level index, based on the mother's rating, highlighted significant differences between the accident groups for boys and girls whereas the teachers' rating failed to show any such differences for boys or girls. Also their "Discipline Problem Index" showed significant differences between the accident groups for boys but not for girls. However, their "Disobedient Index" failed to show any differences between accident groups for boys or girls.

On the basis of Manheimer¹⁵ results one would expect that those children who were extremely assertive, very hostile, hyperactive, very self confident, or extremely impulsive, as measured by the Behaviour Profile, would be significantly over-represented in the high accident group. This was not supported by the present findings. Similar suppositions on developmental background and medical factors are not supported by the results from the present study.

One possible explanation for the disparate findings may be the difference in the methods. The Manheimer¹⁵ investigation was a cross sectional study of 4-18 year olds whereas the present study was a longitudinal study of children during their first five years. This study used psychometrists, doctors, and other trained personnel and standardised tests as well as mothers' reports. This contrasts with the Manheimer study¹⁵ which relied solely on mothers' and teachers' reports. Finally, a non-accident control group was included. There was no control group in the Manheimer study.

A further explanation for the present findings could be that the characteristics of children who have accidents change over time.³²

Whatever the explanation, studies which attempt to identify young children who have an increased liability to accidents beg the question. Having identified the correlates of child accidents, (if any), their relative importance, and their interaction, what is to be done? Whilst it may be possible in a work environment to make a case for identifying certain people with appropriate characteristics (particularly from an anatomical and physiological viewpoint) in order to minimise the risks associated with working in that environment, such an approach is neither practical nor desirable in the domestic context, the site of most accidents to young children. The results of the present study indicate that even if such an approach were practical and desirable, it would only deal with a very small percentage of child accidents.

Attempts to focus on the characteristics of children who have accidents may also have an inhibitory effect on accident prevention. Wigglesworth³³ argued that the identification of persons who are more liable to have accidents implies that they will be injured whatever the conditions of the environment. Under these circumstances there is little incentive to remove the hazardous situation or introduce additional safeguards. This is unfortunate as there is a consensus that passive countermeasures (that is, those that are independent of human behaviour) are more likely to be successful than those that are active (that is, those that are dependent on human behaviour).³³

Given the lack of utility and the inhibitory nature of attempts to identify those more liable to accidents, future child accident prevention research should focus on identifying unsafe aspects of the environment with a view to removing or modifying them so that all children may benefit.

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