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Type of Childcare at 18 Months—II. Relations with Cognitive and Language Development

E. C. Melhuish, E. Lloyd, S. Martin and A. Mooney

Abstract—In a longitudinal study of women and their first-born children the relationship between type of day care experience and cognitive and language development at 18 mths of age was considered. There was a strong association between socio-economic characteristics and type of day care and analyses allowed for this. The results for cognitive development indicate a relationship with mother's education but not with type of day care. For language development the results indicate that children who experience group care were less likely to show much production of different word combinations, but that this was related to the children's language environments.

Keywords: Day care, cognitive development, language development, language environment

Introduction

A general conclusion reached by reviews of the day care literature is that there is not consistent evidence of deleterious effects of day care on cognitive and language development (Ricciuti, 1976; Hoffman, 1979; Belsky & Steinberg, 1978). The inconsistency in the existing research can be illustrated by considering some relevant studies. Cochran (1977) compared children from high quality centres, family day care and home care in Sweden. There was evidence of differences in language development at 12 mths for the different day care groups but not at 15 and 18 mths of age. Schachter (1981) found evidence of decrements in cognitive development for toddlers receiving non-parental day care. Conversely, Clarke-Stewart (1984) found more advanced cognitive development for children who attended centre day care than children who were at home or in family day care. Also Rubenstein, Howes and Boyle (1981) found some evidence of better language development for children who had received centre day care as compared with a home-reared group.

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One finding which does emerge with reasonable consistency from the literature is that for children from disadvantaged families good quality day care may well improve cognitive development (Golden *et al.*, 1978; Ramey & Mills, 1977). Similar effects have been reported for language development by O'Connell and Farran (1982). However, the nature of day care is critical. Schwarz *et al.* (1981) found that children from impoverished homes who received low quality day care showed deficits of cognitive development as compared to children from similar backgrounds reared at home. Bradley and Caldwell (1976) and studies by others have shown that differential home environments, particularly where there is variation in responsive stimulation, may produce effects on language and cognitive development. Differences in day care environments may have similar effects.

McCartney (1984) and McCartney, Scarr, Phillips and Grajek (1985) report on a study of children attending various day centres in Bermuda. One of the centres provided more language stimulation from caregivers to children than the others. The children at this centre had better language development than children at the other centres. These differences could not be explained by differences in the home background of the children. Day care is not uniform. Hence different day care environments may produce different effects. Considering the effects of different types of care forms the basis of this report. Cognitive and language development at 18 mths of age were investigated for groups of children who had consistently experienced a particular type of day care. Those types were nurseries (day care centres), childminders (family day care), relatives and home care. Does experience in these different types of care have implications for cognitive or language development at 18 mths of age?

Method

Sample

A description of the study and the initial recruitment of the sample and sample characteristics is given in the preceding paper.

Procedure

Data on the women and children in the study were collected at four contacts. These occurred when the child was 5, 11, 18 and 36 mths of age. The first contact was used to establish the characteristics of the women and children in the four groups prior to the return to employment and the start of day care.

This report concerns data collected when the children were 5 and 18 mths old, enabling the comparison of children prior to day care and after at least 9 mths of full-time day care experience. The 5 mth contact included interviews with the mothers, Bayley Scale psychomotor (PDI) and mental development indices (MDI). The 18 mths contact included an interview with the mother, Bayley Scales MDI, and mothers kept a diary of the child's week and language utterances.

The record of language utterances involved the mother keeping a record of all the separate language utterances that the child made during the course of that week. Repetitions of utterances were not recorded. Hence the record was of the different words and word combinations produced in 1 week. A validity study was carried out on a subsample of 23 who were administered the Reynell Developmental Language Scale (Reynell, 1969). The researcher who administered this scale was blind to the language record data. The scores on the language record data and the Reynell expressive language scale produced a Spearman rank-order correlation of 0.86. At 18 mths of age most children are producing a limited range of language utterances and it was relatively easy for mothers to keep an accurate record of those utterances produced by their child. The only mothers who had difficulty keeping complete records were those whose

children had very large vocabularies (100 + words and combinations). In these cases the records were ample to assign a level of productive language ability in terms of number of single words and number of word combinations, as the difficulty only occurred when the child was clearly above the criterion for the highest category of productive language used in the analyses for this study.

Results

As the study progressed there was considerable change in the day care arrangements of the sample. Such change is a complicating factor when trying to differentiate the effects of various types of day care. For the analyses reported here, four day care groups were selected, home, relative, childminder (family day care) and nursery (day care centre). For these groups the child was in the same type of day care for at least 25 hrs per week for the period from 9 to 18 mths of age. Periods totalling up to 1 mth in other types of day care were allowed. Fifty-three families in the study at the third contact had patterns of day care which did not fit these criteria. This was sometimes due to the mother ceasing employment, or changing from full-time to part-time employment and day care use, or sometimes changing types of day care. There were 193 women and children in the four study groups used in subsequent analyses of cognitive and language development. (These study groups include additional subjects to those included in the analyses of the previous paper as staff resources limited the number of caregiver observation visits.) These study groups differed markedly in socio-economic characteristics as shown in Table 1. The social classes referred to were as defined by the Office of Population and Censuses (1980).

Table 1. Socio-economic characteristics of the study groups prior to child's birth

	Home	Relative	Childminder	Nursery
Number in group	57	30	74	32
Income, £/mth mean (S.D.)	1009 (349)	971 (330)	1033 (266)	1119 (331)
Occupational status				
Both parents higher status	32%	20%	50%	60%
One higher, one lower	17%	13%	18%	34%
Both parents lower status	51%	67%	32%	6%
Mother's education				
No qualifications	28%	23%	5%	0%
School level qualifications	37%	57%	38%	22%
Higher education qualifications	35%	20%	53%	78%

Note: higher status = social class I or II (e.g. professional, managerial); lower status = social classes III, IV or V (e.g. clerical, sales, manual).

The nursery group was markedly the most advantaged group in terms of income, occupational status, and mother's education. The relative group was the least advantaged. The numbers in the groups and gross characteristics of non-parental day care used by the study groups are shown in Table 2.

The three dual-earner groups had used day care for similar periods of time. The hrs per week are similar for the childminder and nursery groups but slightly less than the relative group. The groups differ most markedly on the child:adult ratios with the nursery group having much the least advantageous child:adult ratio.

Table 2. Characteristics of non-parental day care

Characteristic	Home	Relative	Childminder	Nursery
No. of boys in group	25	11	46	15
No. of girls in group	32	19	28	17
Mean No. of weeks npdc (S.D.)	0	44 (10)	41 (8)	43 (6)
Mean hrs/week npdc (S.D.)	6 (2)	30 (19)	36 (9)	35 (6)
Mean child/adult ratio (S.D.)	—	1.3 (0.5)	2.5 (1.2)	4.6 (1.9)
Range of child/adult ratio	—	1–3	1–5	2.4–8.5

Note: npdc = non-parental day care.

Cognitive development

The measure of cognitive development used was the Bayley mental development index (MDI). The scores at 5 and 18 mths of age for the four day care groups can be seen in Table 3.

Table 3. Bayley mental development index

Age of child	Home mean (S.D.)	Relative mean (S.D.)	Childminder mean (S.D.)	Nursery mean (S.D.)
5 mths	111 (13)	115 (19)	108 (13)	111 (14)
18 mths	114 (20)	107 (16)	114 (16)	117 (12)

The groups differ in socio-economic status, and there are slight differences in developmental status at 5 mths of age prior to day care starting. Do the children who experience different types of day care differ in their progress in cognitive development? This question involves consideration of change in MDI scores from 5 to 18 mths of age. The Pearson product-moment correlation between MDI scores at 5 and 18 mths of age was 0.27. In order to analyse the data for change in MDI scores the form of regression analysis described by Plewis (1985) was used. For fixed MDI scores there was a statistically significant relationship between MDI scores at 18 mths and day care group [$F = 2.66$ (3,185), $p < 0.05$]. The nursery group showed most improvement and the relative group least. However, as Table 1 shows, parental occupation, parental income and mother's education are also associated with day care group. Parental occupation, parental income and mother's education are strongly associated with each other. Of these measures of socio-economic status mother's education is most strongly associated with progress in MDI scores. There was approximately 1 S.D. difference in mean MDI scores between children with highly qualified mothers and children with mothers having no educational qualifications. When MDI at 18 mths is regressed against MDI at 5 mths, child gender, mother's education and day care group, neither child gender, nor day care group are statistically significant. However, mother's education does have a statistically significant relationship with MDI at 18 mths ($t = 3.56$, $p < 0.001$) and hence the association between cognitive development and day care group is not a causal one but arises merely because both variables are associated with mother's education. The decline in MDI scores from 5 to 18 mths for the relative group reflects the lower levels of maternal education for this group.

Language record data

These data were scored as the total number of separate single words and the total number of separate word combinations. For an utterance to count as a word combination the words in the combination had to appear in the language record as part of other utterances as well as in the utterance being scored. For example, the utterance 'give drink' would only be scored as a word combination if 'give' and 'drink' occurred separately in other utterances.

The distribution of single word scores for the day care groups is shown in Table 4. There were 24 cases where the language record data was not completed adequately by the mothers while the child was between 18 and 19 mths of age, and these cases were excluded from the analyses of language data. As the distribution of the language data did not approximate to normal distributions, non-parametric statistics were used. The number of single words was categorized into five levels as in Table 4. The single word variable was entered into a logistic regression against child gender, mother's education and dummy variables representing the day care groups. Only mother's education showed a significant association with number of single words ($\chi^2 = 3.97$, d.f. = 1, $p < 0.05$); adding further variables into the regression did not have any significant effect.

Table 4. Number of single words at 18 mths of age

No. of words	Home		Relative		Childminder		Nursery	
	N	%	N	%	N	%	N	%
0-19	18	33	8	36	18	29	10	33
20-39	8	15	6	27	15	24	6	20
40-59	6	11	1	5	16	25	7	23
60-79	9	17	3	14	2	3	4	13
80 +	13	24	4	18	12	19	3	10

The distribution for word combination scores for the day care groups is shown in Table 5, which also shows the categories used in analyses. The word combinations variable was entered into a logistic regression model against child gender, mother's education, and dummy variables representing the day care groups. The logistic regression model producing the best fit with the data was word combinations regressed against gender, mother's education and the dummy variable representing the

Table 5. Number of word combinations at 18 mths of age

Combinations	Home		Relative		Childminder		Nursery	
	N	%	N	%	N	%	N	%
0	32	59	14	64	38	60	22	73
1-4	5	9	1	5	10	16	6	20
5-9	8	15	2	9	9	14	1	3
10 +	9	17	5	23	6	10	1	3

presence/absence of nursery care. This model was statistically significant ($\chi^2 = 10.81$, d.f. = 3, $p < 0.02$); child gender had a significant effect ($\chi^2 = 4.43$, d.f. = 1, $p < 0.05$), girls scoring higher than boys; the nursery care variable was significant ($\chi^2 = 4.65$, d.f. = 1, $p < 0.05$); and mother's education approached significance ($\chi^2 = 3.33$, d.f. = 1, $p < 0.10$). The effect of the nursery care variable reflected the lower proportion of children in the nursery group showing high levels of word combinations.

In the previous paper, it was found that there were marked differences in observations of children's experiences and behaviour, particularly between those children in the nursery group and others. Two aspects of these observed differences which might be expected on theoretical grounds to affect language development are the responsiveness of others to a child's communications and the amount of language that is addressed to a child. Clarke-Stewart (1973) found that the responsiveness of adults in the home was related to the language development of children and Wachs and Gruen (1982) have discussed the potential importance of such experience for several aspects of development. Also, the greater children's experience of others talking to them, the greater their opportunities for learning language. Therefore the differences found in the total word combinations shown by the nursery group may reflect differences in language experience which this group experienced.

To test this proposition, further variables reflecting responsiveness (the proportion of a child's communications which were responded to) and total language addressed to the child (number of language utterances per hr) were entered into the logistic regression model. If responsiveness was added to the model then there was no longer any effect for nursery care. The model was statistically significant ($\chi^2 = 15.29$, d.f. = 4, $p < 0.005$); responsiveness had a significant effect ($\chi^2 = 4.05$, d.f. = 1, $p < 0.05$); child gender was also significant ($\chi^2 = 3.65$, d.f. = 1, $p < 0.06$); mother's education approached significance ($\chi^2 = 2.84$, d.f. = 1, $p < 0.10$); and the nursery care variable was not significant.

If the total language addressed to the child was added to the model, again the effect of nursery care was no longer significant. The model was statistically significant ($\chi^2 = 17.69$, d.f. = 4, $p < 0.002$); total language had a significant effect ($\chi^2 = 6.92$, d.f. = 1, $p < 0.01$); child gender was significant ($\chi^2 = 4.46$, d.f. = 1, $p < 0.05$); mother's education was almost significant ($\chi^2 = 3.59$, d.f. = 1, $p < 0.06$); and nursery care was not significant.

If both responsiveness and total language were simultaneously added to the model, then the effects of nursery care and responsiveness were not significant. The model was statistically significant ($\chi^2 = 18.59$, d.f. = 1, $p < 0.005$); total language produced a significant effect ($\chi^2 = 5.30$, d.f. = 1, $p < 0.05$); child gender was significant ($\chi^2 = 4.59$, d.f. = 1, $p < 0.05$); mother's education was almost significant ($\chi^2 = 3.62$, d.f. = 1, $p < 0.06$); and neither nursery care nor responsiveness were significant.

The model which produced the best fit with the data was total word combinations regressed against child gender, mother's education, and total language addressed to the child. Within this model ($\chi^2 = 17.50$, d.f. = 3, $p < 0.001$), the total language variable had a very significant effect ($\chi^2 = 12.53$, d.f. = 1, $p < 0.0005$) and the child gender ($\chi^2 = 2.88$, d.f. = 1, $p < 0.10$) and mother's education ($\chi^2 = 3.39$, d.f. = 1, $p < 0.10$) approached significance.

Discussion

The results of this study indicate that type of day care did not influence cognitive development at 18 mths of age. With regard to language development, there were no differences for day care groups in the number of single words produced; however, the nursery group children were less likely to have high numbers of different word combinations. Mother's education affected cognitive and language development and girls produced more word combinations than boys. It was not the case that the nursery group could be said to be showing a deficient level of language development in the sense of being below normal. The nursery group showed a similar distribution of number of single words as the other groups. The language scores of all groups were within the normal range; however, the nursery group was less likely to have language records indicative of advanced language development, in that a significantly smaller proportion showed high numbers of word combinations. Some caution would be in order in interpreting these results as the nursery group comprised only 32 children. However, the home backgrounds of these children were fairly homogeneous in that they were all in relatively advantaged households. The results are particularly striking when the socio-economic advantages of the nursery group over the other day care groups, as shown in Table 1, are considered, as more advantaged groups would be expected to show better language development. A similar result has recently been reported for a U.S. sample by Desai, Chase-Lansdale and Michael (1989), where language development scores were depressed for children who attended day care only when they were from middle class homes.

The relationship between the quality of care provided at home and out-of-home is likely to be a decisive factor concerning day care influence. Where the quality of out-of-home care is superior to that at home then beneficial effects are to be expected as reported for studies of children from disadvantaged families (e.g. Golden *et al.*, 1978; Ramey & Mills, 1977; O'Connell & Farran, 1982). However, where the quality of out-home-care is inferior to that at home detrimental effects may occur as shown in this study and that of Desai *et al.* (1989). Hence, both positive and negative effects are to be expected as a function of the relationship between the quality of home and out-of-home care, with no effects with equivalence of care. A corollary of this point is that the same day care may have different effects for different groups of children depending on the relative quality of home care available.

At 18 mths of age, children are at that stage of language development where word combinations are starting to be acquired (Brown, 1973). Hence this aspect of language development might be particularly susceptible to environmental influence at this age. Different aspects of development are likely to be differentially sensitive to environmental influence at different ages and to be most sensitive when at their most rapid rate of development. At another age an aspect of development other than language may become susceptible to an environmental influence such as day care.

Differences in interactional experience provided by the four childcare settings are described in the preceding paper. Children in nurseries experienced less verbal communication, and less responsiveness from others. These are aspects of interactional experience which might be expected to affect language development, and produce the differences in language scores seen in this study for the nursery group. The analyses

reported which consider the effect of responsiveness and total language addressed to the child support this interpretation. When either responsiveness or total language addressed to the child were added to the logistic regression model the effect of nursery care disappeared. Therefore the differences in language scores observed for the nursery sample in this study would appear to be best explained by aspects of the language environment provided within that type of care, with total language addressed to the child being the most potent variable. Hence the results reflect a difference in the quality of care rather than an inevitable aspect of nursery care. In this regard the findings of this study parallel those of [McCartney \(1984\)](#) on the effects of quality of day care on language development.

It could be argued that those women who are in full-time employment have less opportunity for noting the words used by their child. However, at 18 mths of age, the language used by the child is such that a parent with only evening and weekend experience of being with the child can keep an accurate record. Also, the same point would apply equally to all the employed women, yet it is only for the nursery group that the effect on number of word combinations appears. The hrs of non-parental day care are shown in Table 2 and they were higher for the childminder group than for the nursery group, so that differences in time with mother cannot account for the differences in the language scores between day care groups.

Hoffman (1979) makes the point that families where mothers are employed will differ depending upon the social milieu in which they live. In particular, in societies where dual-earner families are the norm, they will have different characteristics than in societies where they are the exception. A similar point is valid in considering the differences between families who use different forms of day care. The study reported here concerned two-parent families in London, and the nursery sample was more advantaged on socio-economic characteristics than the other groups, particularly on occupational and educational characteristics. Somewhat paradoxically, the private sector nurseries that they used were largely poorly resourced and may differ markedly from nurseries in other societies where a different tradition of nursery care exists and where different results may well be found (e.g. Cochran, 1977). The interpretation of results needs to consider these aspects of the population and the types of care studied. Day care is homogeneous; not all nurseries are homogeneous.

While the nurseries in this study were a stable type of day care, in that the children stayed in the same nursery, the number of separate caregivers within the nursery and staff turnover would mean that children were more likely to experience a wider range of caregivers than at home, with relatives or childminders. With a stable caregiver, the caregiver has greater experience with the child and hence greater opportunity for understanding the idiosyncracies of a child. Children in the early years have very idiosyncratic ways of communicating, including how they use and pronounce words (Brown, 1973). Where these idiosyncracies are known and understood the likelihood of an adult responding at all and responding appropriately will be enhanced. Hence stability of caregiver is likely to improve the child's experience of response language and may be an important differentiating factor between day care environments.

The results reported here apparently reflect the effects of quality of childcare rather than the effects of type of care. The quality of childcare resides essentially in the

experience provided for children which may affect development and well-being. These experiences would include adult and peer interaction, interpersonal relationships, learning activities, health and safety, and emotional climate (Melhuish & Moss, 1990). Other factors, such as child:adult ratio, group size, curriculum and training, stability, working conditions, status and salary of caregivers, are associated with and can facilitate good quality care, but they do not guarantee it. Research in the study of day care needs to take further the issues of differences between environments and how these may affect children's experience and development. The impact of differential environments will change depending upon the age of children being studied, as different aspects of development will be more susceptible to environmental influence at different ages, and there is also a need to study the alternative environments that a society makes available for children.

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