



Acta Genet Med Gemelloi 36:213-223 (1987)
© 1987 by The Mendel Institute, Rome

Speech and Language Development in Preschool Twins

D.A. Hay¹, M. Prior², S. Collett², M. Williams²

¹ Department of Genetics and Human Variation, and ² Department of Psychology, La Trobe University, Bundoora, Victoria, Australia

Abstract. While language, articulation and reading problems have been well documented in young twins, it is not clear how extensive such problems can be or how early in childhood they become evident. At the age of 30 months, twin boys in the La Trobe Twin Study were 8 months behind matched singletons and twin girls on expressive language and 6 months behind on verbal comprehension. They were also 5 months behind on symbolic play and this delay was closely related to language. "Secret" language characterised most of the twin boys but not the girls and the relation of this to articulation delays is discussed. To examine if exposure to other children helps the twin boys, 38-53 month old twins and singletons were matched on the Columbia Mental Maturity Scale at the time of starting preschool. The twin boys had more articulation problems and all twins scored much lower on a Sociability questionnaire completed by the teacher. After 8 months at preschool, all children had advanced in Sociability, but the twins remained just as far behind with poor Sociability relating to poor articulation. The role of intervention programs is discussed.

Key words: Twins, Language, Play, Sociability, Sex differences, Preschool

I. INTRODUCTION

Speech and language are the key to behavioural differences between twins and singletons and to the ability and achievement problems which twins may experience. Since Day's report in 1932 [5], it has been increasingly recognised that young twins may be delayed in many aspects of speech and language including delayed onset of speech, poor articulation, decreased speech production, synpraxic (concrete and action-bound) speech and deficient sentence construction and usage. [See 20 for review]. While speech and language delays and lower verbal IQ

scores are common in preschool twins, the Louisville Twin Study [23] reports few problems remain in these areas after the age of six.

However, specific deficits may remain. In a Canadian sample [22] half the nine-year old twin boys were receiving speech therapy and/or had been kept back a grade in school. A series of papers based on the La Trobe Twin Study of Behavioural and Biological Development [8] and on their analyses of twin data from the 1975 Australian Council of Educational Research (ACER) National Survey of Literacy and Numeracy, confirmed that many twin boys experience scholastic difficulties. Significantly more twin boys had delays in reading [11], the best predictor of these being a history of speech language problems in the preschool years. School difficulties extended to numeracy skills, where the effects of poor reading skills were confounded by poor concentration and motivation [10]. Furthermore [9], twins and singletons had different reading problems with the reading-disabled twins being often characterized by speech problems and by reading reversals, eg, 'b' as 'd'.

Despite their importance, the reasons for language delay in young twins are unclear. The causes seem largely not to lie in the greater pre- and perinatal biological problems twins may experience [3]. Explanations focus on three distinct but possibly overlapping areas of the postnatal social environment:

- 1) Reduced opportunity for interaction with parents. Because of the extra time parents of twins have to spend on the routine care needed for twins, the children experience unavoidable neglect [4]. At the same time, the fact there are two children means that language and interaction must be divided between them. Such "relative deprivation in maternal didactics" [1] may contribute to lower language and verbal reasoning performance. As well as being reduced in quantity, the speech of mothers of twins to their children is also less conversational and more directive, all these factors contributing to differences within the twin population as well as between twins and singletons [21].
- 2) Increased interaction between twins. Several clinical examples exist [7,16] of twin pairs whose excessive closeness led to delays in language, cognition and social development. Cryptophasia ("secret language" or idioglossia) between twins also may be a feature of twins who spend much time together although a retrospective survey of adult twins [24] found little overlap between reports of cryptophasia and of language delay. One corollary of such close interaction is that both MZ and DZ twins should show high cotwin correlations for language problems and misarticulations since they will reinforce each other's mistakes. Thus, Johnston (Unpubl. Hons. Thesis, La Trobe 1982) reports correlations above 0.9 for language difficulties in both MZ and DZ pairs.
- 3) Competition between twins. Savic [20] argues that twins compete with each other for adult attention and that strategies adaptive for this role may be disadvantageous in other language contexts. Thus, twins may speak very quickly and omit consonants or even whole syllables in order to get their information across more quickly. Conversely, this pressure to be identified in communication does accelerate some aspects of language development such as the acquisition and correct usage of personal pronouns.

The present paper focuses on two aspects of early language development, germane to the causes and remediation of language delay. Firstly, is the delay a more general effect on cognitive development? Are twins also delayed in areas such as symbolic play which Piaget [18] termed the precursor to language? Piaget views this acquisition of representation as crucial to a child's development and fundamental to language which also requires representational abilities. In Luria and Yudovich's study [16] of a pair of severely disadvantaged and language delayed twin boys, there was a total lack of imaginative play. This improved during the course of the

program especially in the twin receiving language therapy, indicating some interdependence of play and language. Outside this exceptional pair, if twins are delayed in both symbolic play and language, some overall developmental lag is indicated, but if play is normal and only language delayed, the implications are different. Twins would have the representational skills which are the basis for language, but perhaps through the three reasons discussed above are unable to apply them to language.

The second aspect of twin language development to be examined concerns the social situation. It is via others that language is learned, and it is one or more aspects of the social situation which probably delay language in the twin situation. Language ability and social behaviour correlate in pre- and primary school twins [2,9,12,13]. In exceptional twin pairs [7,16] social intervention encouraging interaction with peers and limiting communication with the cotwin "created an objective necessity for speech communication" [7], leading to improved language skills. The question remains whether exposure to other children in the preschool setting advances the language and social behaviour of more normal twins or whether the within-pair interaction of twins forms an effective barrier to their contact with other children [2].

II. SYMBOLIC PLAY AND LANGUAGE

Symbolic games are most frequent at the beginning of Piaget's representational stage [18], ie, between 18 and 36 months of age. In an extensive investigation of developmental trends [14], 30 months is when children reach the ceiling of possibilities with the toys and dolls usually presented in studies of symbolic play. Thus, this investigation is based on children of 30 months \pm 3 weeks, an age below which few of the other measures of language and intellectual functioning needed for this study are available.

1. Method

a. Subjects. Nine pairs of male and 6 pairs of female twins from the La Trobe Twin Study [8] were matched with 15 singletons on age, sex, parental socioeconomic class and performance on the original Vineland Social Maturity Scale [6]. The singletons were obtained via personal contacts and through local government Infant Welfare Centres.

b. Psychological Tests. *Vineland Social Maturity Scale.* The Vineland is a measure of general intellectual and social functioning, correlating up to 0.8 with more conventional measures of ability such as the Stanford-Binet [6]. It has few items relevant to nonverbal ability, a point common to many tests for this age-range. The Vineland was chosen because it involves questioning the mother rather than the child and thus reduces the testing time for each child. *Symbolic Play Test* [15]. This test used four independent sets of miniature objects, presented in a standard manner and left to the child to use in any way seen fit in order to evaluate spontaneous nonverbal play activity. The test requires no verbal instructions and is scored independently of the child's verbalisations, relying only upon the meaningful responses and connections the child makes with the objects, eg "feeding" a doll with a toy spoon. Reliability coefficients for this test range from 0.74 to 0.92 [15].

Reynell Developmental Language Scales (1977 Revision). The scales involve presenting toys and asking standard questions to assess verbal comprehension and expressive language. The former requires no spoken response but only such actions as pointing to objects (to assess understanding of verbal labels) and placing two objects together (to assess ability to relate

two objects). The latter requires minimal verbal comprehension and assesses vocabulary by the child naming objects and creative use of language by the child describing pictures. In the Dunedin Multidisciplinary Child Development Study which incorporated some comparisons of twins and singletons [17], the Reynell had high concurrent validity as a measure of language development.

c. Procedure. All children were tested at home and after rapport had been established with the singleton or twins. Twins were tested separately but by the same person. The Symbolic Play Test was administered before the Reynell as its spontaneous play precedes the Reynell's directed use of objects [15]. Breaks were allowed when the child being tested appeared fatigued or distracted. The Vineland was then administered to the parent and demographic information obtained.

2. Results

Results were averaged over each twin pair because of the problems in treating each twin separately when they have identical, interdependent matching variables. Table 1 indicates the considerable similarity within twin pairs especially on the matching variable, the Vineland. They are also very similar on Reynell Expressive Language relative to Reynell Verbal Comprehension, emphasising the earlier point about the cotwin environment and spoken language.

The means of the four groups are shown in Table 2. On the Vineland, male twins were significantly less mature than female twins ($t_{13} = 2.28$, $P < 0.05$), but within each sex the

Table 1. Intrapair correlations on the behavioural test (N = 15 pairs)

Vineland	Symbolic Play	Reynell Expression	Reynell Comprehension
1.00***	0.59*	0.94***	0.61*

* $P < 0.05$, *** $P < 0.001$

Table 2. Means (\pm SD) on the behavioural tests

Group	Vineland Social Age (in years)	Symbolic Play (in months)	Reynell Expression (in months)	Reynell Comprehension (in months)
Male twins (N = 9)	2.96 \pm 0.40	28.18 \pm 3.68	24.78 \pm 4.91	28.44 \pm 2.07
Male singletons (N = 9)	3.07 \pm 0.42	33.12 \pm 1.38	32.33 \pm 3.16	34.78 \pm 3.45
Female twins (N = 6)	3.43 \pm 0.37	31.20 \pm 2.52	32.75 \pm 2.75	32.42 \pm 2.28
Female singletons (N = 6)	3.20 \pm 0.36	32.79 \pm 2.26	31.17 \pm 2.79	33.17 \pm 2.40

matching procedure ensured there were no significant differences between the singleton-twins groups. All children scored above the 2.5 year level expected from their chronological age, which may reflect the 1965 norms for this version of the Vineland.

On the Symbolic Play Test, the one significant comparison in an analysis of variance was between twins and singletons ($F_{1,26} = 9.34, P < 0.01$). There was no significant sex difference or twin \times sex interaction. In contrast on both the Reynell Expressive Language and Verbal Comprehension scales there were significant twin \times sex interactions (respectively $F_{1,26} = 9.79, P < 0.01$ and $F_{1,26} = 6.87, P < 0.02$). In both cases, male twins were much further behind their singleton counterparts relative to the situation in females. Only on the Verbal Comprehension scale were the twins as a group behind the singletons ($F_{1,26} = 11.05, P < 0.01$). Compared with their age norms and not just the matched controls, the male twins consistently achieved below-average scores: by 2 months on Symbolic Play, 5 months on Reynell Expressive Language, and 1.5 months on Reynell Verbal Comprehension. They also differed from the female twins in that their parents reported a higher rate of "secret language" or cryptophasia. Seven of the 9 male pairs exhibited cryptophasia, compared with 1 out of 6 female pairs, a significant difference (Fisher Exact Test, $P < 0.05$).

If one examines which children were delayed by calculating correlation coefficients between Symbolic Play and the two Reynell scales, the twins differed from the singletons. There were no significant correlations in the singletons, whereas both correlations were significant for male twins (Reynell Expression and Symbolic Play $r_{16} = 0.56, P < 0.05$, and Reynell Comprehension and Symbolic Play $r_{16} = 0.85, P < 0.01$). In the female twins, the corresponding correlations were $r_{10} = 0.63 (P < 0.05)$ and $r = 0.36$ (not significant).

Thus, the picture is one of a general delay in cognitive representation both of language and symbolic play in twins. The effect on twin girls is slight and probably of little consequence given they are still above their age norms on all test. The situation in twin boys is more serious with sizeable discrepancies relative both to their age norms and more importantly to matched controls. The Vineland results show that the twins are still competent in terms of such maintenance skills as feeding and dressing. But unlike the new revision of the Vineland, the 1965 version used here asked little about language or play and hence probably overestimated the twins' social maturity.

These results have a remarkable parallel to those obtained with older Australian twins on literacy measures - the girls behind by only a small amount but the boys much further behind especially on aspects of verbal skills other than comprehension [9,10,11]. Although the nature of sex differences in twin ability are disputed [5,24], the results here indicate that twin boys are at a "double disadvantage" - if both males and twins generally experience more language-related difficulties, then one would expect children experiencing the two risk factors to be particularly affected.

III. PRESCHOOL SOCIAL BEHAVIOUR AND LANGUAGE SKILLS

If twins have a delay, the next question to ask is whether language is improved by forcing more social interaction with other children. However, one can never tell what is cause and effect. Koch [13] considered whether twin girls in her study had more social involvement than the boys because of their better language or whether their language led to more social interaction. What is described here is a study of language and of social behaviour before and after the period of enforced contact with other children constituted by preschool and the extent to which gains in social behaviour relate to language skills. One has to be particularly careful

of such unique aspects of the twin situation as Koch's "prima donna" effect [13], the fact that twins may attract more attention and apparent friends, not by their social behaviour and their skills at acquiring and maintaining friends, but simply because of their uniqueness as twins and the attention they generate. It was for this reason that the structured Roper and Hinde teacher rating of social behaviour was used [19], since with its 40 items, it covers a wider and more objective spectrum of social behaviour, less contaminated by the attention the children receive as twins.

1. Method

a. Subjects. The sample size was small because of the work involved in the precise matching of twins and singletons and the repeat testing. The results are based on 19 twins considered by parents to be monozygotic. These comprise 4 female-female twin pairs, 4 male-male twin pairs, 3 males whose cotwin could not be matched with an appropriate singleton (see below). All twins were enrolled in the La Trobe Twin Study and were aged 38-53 months at the start of the project. The other requisite was that they have no previous experience of kindergarten but be enrolled to start preschool.

These 19 twins were matched individually with singletons enrolled to start at the same preschool. Matching was on the basis of sex and mental age, as assessed by the Columbia Mental Scale. The criterion used was that the mental ages of the two children be within five percentile points. These matching criteria were sufficiently difficult to achieve without trying to match also on chronological age and parental socioeconomic status. However, 15 of the 19 matched pairs differed by less than 4 months in chronological age and none were more than 8 months different. With the stratified nature of Australian cities, the fact that matched children came from the same preschool and hence the same suburban region meant that there was a high degree of similarity in parental socioeconomic status.

b. Psychological Tests. *Columbia Mental Maturity Scale (CMMS).* The CMMS is an individual test for children from 3 1/2 to 10 years which measures general reasoning ability including classification skills and symbolic concepts. It was chosen because it is age-appropriate, brief, colourful and encouraging for children and particularly because it has minimal verbal involvement. The child is required to pick the odd-one-out from series of drawings on cards. Thus children can be matched on general reasoning ability and mental maturity without also directly matching them on language competence. It has split-half and test-retest reliabilities of > 0.86. *Reynell Developmental Language Scales.* These were used in the study of symbolic play and are fully described there. It was found necessary also to record articulation errors since the Reynell has no provision for these. A child may score highly on the Expressive Language section even when misarticulations are so common as to render speech almost unintelligible. Because of the age ranges, standard scores (mean = 0.0) have had to be used rather than the Mental Age scores used in the Symbolic Play study.

Roper and Hinde Teachers' Questionnaire for Individual Differences in Social Behaviour. This questionnaire involves 40 items each rated on a 7-point scale and concerning specific behaviours applicable to normal preschool children [19]. While all 40 items were administered, only the 20 items included in Factor 1 (Sociability) were utilised here as the dimension of particular relevance. In the case of the twins, 12 items were added, referring specifically to the child's behaviour towards his/her cotwin. For example, to Item 1 ("Is quiet, seldom talks to others")

was added Item 1B ("Is quiet, seldom talks to cotwin"). These items generated a separate scale, by which general sociability could be distinguished from that towards the cotwin.

c. Procedure. Each child was first tested at home in a 5 1/2 week period starting in late January, which in Australia is one week before preschool begins. All the twins were tested (separately but by the same tester) and then a sample of singletons. The CMMS was administered before the Reynell so that any singleton whose CMMS score did not match that of a twin could be discarded without spending time on the Reynell. Because this matching was on an individual basis, the analyses are based on individual twins rather than on the average over a twin pair used in the Symbolic Play study.

The preschool teachers were asked to complete a Social Behaviour questionnaire for each child as soon as they felt familiar enough with the child. All questionnaires were returned within a 8-week period, the majority during the first month.

A second set of Social Behaviour questionnaires was mailed out to the teachers 8-9 months later in mid-October. This timing allowed the greatest possible interval between assessments while still ensuring the second assessment could be completed before the end of the preschool year in December.

2. Results

All analyses of variance were based on a repeated measures design to take into account the matching of individual twins and singletons on the CMMS. There were no significant sex differences on the CMMS and, as expected from the matching, no twin vs singleton differences or sex interaction effects.

On both scales of the Reynell there were significant sex differences. On the Expressive Language Scale, girls had a mean standard score (\pm SD) of 1.13 ± 0.16 and boys 0.35 ± 0.17 ($F_{1,17} = 8.82$, $P < 0.01$) and on the Verbal Comprehension girls 1.03 ± 0.11 and boys 0.55 ± 0.11 ($F_{1,17} = 15.43$, $P < 0.01$). There were no significant twin vs singleton or interaction effects.

Although Reynell scores were equivalent, twins had more articulation problems than singletons. The tester rated each child's articulation and the parents were asked whether the child had ever experienced articulation problems. In all cases, the tester's current rating and the parents' retrospective report were in agreement. Six of the 11 twin boys had articulation problems compared with 2 of the 11 matched singletons, a difference which, despite the small sample sizes, approaches significance ($P < 0.10$ on the Fisher Exact Probability test). Among the females, 2 of the 8 twins and none of the matched singletons had articulation problems.

The repeat testing on the Social Behaviour questionnaire, together with the matching of children, makes analysis more complex but fortunately the results are straightforward with only two significant effects. Social behaviour improved over time, the mean at the first test being 34.97 ± 1.83 and at the second 42.71 ± 1.39 ($F_{1,34} = 22.34$, $P < 0.001$). With an overall mean of 35.31 ± 1.62 , twins scored significantly below the singleton mean of 42.37 ± 1.69 ($F_{1,34} = 7.56$, $P < 0.01$). There were no sex differences and no interactions. The absence of any significant interaction terms with the two testing occasions is important. It implies that, though social behaviour improved, the magnitude of this difference did not vary significantly according to whether the children were male, female, singleton, twin or any combination of these. Children who were particularly low on social behaviour to start with, did not benefit more by the contact with other children in the preschool.

An alternative means of examining the changes in social behaviour is given in Table 3. For both male and female twins, the conventional Roper and Hinde social behaviour ratings correlated significantly, but the social behaviour ratings to the cotwins showed a sex difference. In the girls, the social behaviour to the cotwin at Time 1, when they started preschool, correlated with both the social behaviour ratings towards others. In boys it did not. This difference is consistent with the view [16] that in boys the cotwin may provide a unique form of social environment different from that provided by adults and by other children. That this special social environment remains throughout the preschool is indicated by the high correlation in boys of social behaviour to cotwin across the two ratings and the corresponding zero correlation in girls.

One difference from the Symbolic Play study was that here twins were not behind the singletons on the Reynell scales. This may have to do with the matching of twins and singletons on the CMMS if this nonverbal test were actually tapping the same abilities measured by the Reynell. Stepwise multiple regression of scores on the Verbal Comprehension and Expressive Language scales supported this possibility but also raised other twin-singleton differences. In singletons, CMMS score was the best predictor on both Reynell scales, accounting for 72% of the variance in Verbal Comprehension and 24% of that in Expressive Language. For twins, the corresponding variance explained by CMMS was 4% and 1%, respectively. Instead in twins, the best predictor of Verbal Comprehension was sex (41% of variance), and of Expressive Language, the presence or absence of articulation problems (62% of variance).

Articulation and language in general also played a major part in predicting social behaviour in a stepwise multiple regression using as independent variables parents' replies to questions about their child's behaviour and development. At the time of starting of preschool, the major predictor was "sociability to adults", accounting for 20% of the variance, but a series of language-related items ("articulation", "babbling", "age at first word" and "language problems") accounted for a further 21%. After eight months at preschool, articulation with 33% of the variance was the first predictor of the social behaviour rating, the other three language questions accounting for a further 10%.

The results of this study indicate that twins have a delay in social behaviour over and above any delay in general ability (as measured by the CMMS) and in verbal facility as measured by the Reynell scales. The Reynell fails to measure speech-related skills such as articulation, where twins do have a problem and which are a major predictor of their social behaviour rating. There are two possible explanations of the connection between articulation and social behaviour.

Table 3. Correlations for social behaviour ratings in twins (N = 11 M, 8 F)

		Social behaviour (Time 2)	Social behaviour to twin (Time 1)	Social behaviour to twin (Time 2)
Social behaviour (Time 1)	M	0.57*	0.13	0.17
	F	0.91**	0.86**	0.14
Social behaviour (Time 2)	M		-0.33	0.04
	F		0.82**	0.18
Social behaviour to twin (Time 1)	M			0.84**
	F			-0.02

Male twins, with their greater articulation problems, may be so because their close bond inhibits the need to acquire reasonable communication skills. That is, both their low social behaviour ratings and their poor articulation are consequences of the twin situation. On the other hand, they may be so close, and hence rate poorly on social behaviour towards other peers or adults, because their poor articulation impedes their interaction outside the twin situation.

IV. DISCUSSION

These results indicate the generality of the developmental delay of twins. As well as language, symbolic representation and social behaviour are affected. All three are related, in that Reynell language measures and symbolic play are correlated as are social behaviour and articulation even when language and general ability are controlled for.

The main question is what to do about these problems. They certainly cannot be ignored in the hope they will disappear with time as this is not the case and they correlate with difficulties throughout years at school [9,10,11]. Simple contact with other children is insufficient to force twins to interact more and articulate better. One can envisage how twins, especially boys, may be isolated in the preschool situation: they can have poor articulation and language, immature play and social behaviour, may still be physically smaller as the result of the prematurity often accompanying a multiple pregnancy [8] and some more recent La Trobe Twin Study research (manuscript in preparation) indicates they are often delayed in fine-motor coordination, impeding their adequate participation in many activities. All these disadvantages may mean that they resort to playing together and not interacting with the other children.

Two related actions may help the twins:

- 1) Some intervention in their articulation and speech in general, so that they can communicate more adequately outside their family. One consequence of the lack of parental time [1,4,21] is that parents may have less time to spend correcting speech errors. At the same time, in competing for parental attention [20], the children may develop speech errors which are reinforced by parental responses to whatever they say, irrespective of its errors.
- 2) Alternation of the twins in preschool, with one attending one day while the other stays at home and the reverse happening the next day. This strategy is being increasingly used in the UK and in Australia and has several obvious merits. At the age of 30 months, when the Symbolic Play study was done, hardly any of the twins had done anything of note when not in each others' company. This procedure forces the ones in preschool to do activities on their own and to interact with the other children, without relying just on their attraction as twins [13]. The ones at home have possibly their first opportunity for one-to-one interaction with a parent [1,21] and the peace to learn to work on an activity without the disruption of their cotwin [8].

While these procedures seem a logical means to proceed, there have been no follow-up studies to indicate their effectiveness. Consider the present study, where introducing twins as a pair to preschool had similarly been thought to be advantageous. But the results showed such is not the case, at least for social behaviour, especially where their articulation was poor to start with.

The next step must be to go beyond identifying the problems which twins may experience and to begin research on remediation and its efficacy. What has worked for singletons may not necessarily work for twins. This point has been made previously in a comparison [9] of

children with reading problems where the twins were characterized by many more speech problems. The multiple regression analysis in the preschool study here may indicate something parallel - in singletons CMMS scores predicted Reynell, while this was not the case in twins where articulation problems were much more predictive. With the frequency of twins in the community and their high incidence of school-related problems [11], the development of adequate and appropriate intervention in the preschool years must be of high priority in psychology and education.

REFERENCES

1. Bornstein MH (1985): How infant and mother jointly contribute to developing cognitive competence in the child. *Proc Natl Acad Sci USA* 82:7470-7473.
2. Burlingham D (1952): *Twins: Study of Three Pairs of Identical Twins*. London: Imago Press.
3. Conway D, Lytton H, Pysh F (1980): Twin-singleton language differences. *Canad J Behav Sci Rev Canad Sci Comp* 12:264-271.
4. Costello AJ (1978): Deprivation and family structure with particular reference to twins. In Anthony EJ, and Coupernick C (eds): *The Child in His Family*, Vol 4. New York: Wiley, pp 59-71.
5. Day EJ (1932): The development of language by twins: I. A comparison of twins and single children. *Child Dev* 3: 179-194.
6. Doll EA (1965): *Vineland Social Maturity Scale: Condensed Manual of Directions*. Minnesota: American Guidance Service Inc.
7. Douglas JE, Sutton A (1978): The development of speech and mental processes in a pair of twins: a case study. *J Child Psychol and Psychiat* 19:49-56.
8. Hay DA, O'Brien PJ (1983): The La Trobe Twin Study: a genetic approach to the structure and development of cognition in twin children. *Child Dev* 54:317-330.
9. Hay DA, Collett SM, Johnston CJ, O'Brien PJ, Prior M (1986): Do twins and singletons have similar language and reading problems? In Pratt C, Garton AF, Turner WE, Nesdale AR (eds) *Research Issues in Child Development*. Sydney: Allen and Unwin, pp 125-134.
10. Hay DA, O'Brien PJ, Johnston CJ, Prior M (1984): The high incidence of reading disability in twin boys and its implications for genetic analyses. *Acta Genet Med Gemellol* 33:223-236.
11. Johnston CJ, Prior M, Hay DA (1984): Prediction of reading disability in twin boys. *Dev Med Child Neurol* 26:588-595.
12. Kim CC, Dales RJ, Connor R, Walter J, Witherspoon R (1969): Social interaction of like-sex twins and singletons in relation to intelligence, language and physical development. *J Genet Psychol* 144:203-214.
13. Koch HL (1966): *Twin and Twin Relations*. Chicago: Univ of Chicago Press.
14. Lowe M (1975): Trends in the development of representational play in infants from one to three years - An observational study. *J Child Psychol and Psychiat* 16:33-47.
15. Lowe M, Costello AJ (1976): *Manual for the Symbolic Play Test*. London: NFER - Nelson.
16. Luria AR, Yudovich FI (1959): *Speech and the Development of Mental Processes in the Child*. London: Staples Press.
17. McDairmid J McK, Silva PA (1979): Three year old twins and singletons: a comparison of some perinatal, environmental, experiential and developmental characteristics. *Austral Paediatr J* 15:243-247.
18. Piaget J (1952): *Play, Dreams and Imitation in Childhood*. London: Routledge and Kegan Paul.
19. Roper R, Hinde RA (1979): Teachers' questionnaire for individual differences in social behaviour. *J Child Psychol* 20:287-298.
20. Savic S (1980): *How Twin Learn to Talk: A Study of the Speech Development of Twins from 1 to 3*. London: Academic Press.
21. Tomasello M, Mannle S, Kruger AC (1986): Linguistic environment of 1- to 2-year old twins. *Develop Psychol* 22:169-176.
22. Watts D, Lytton H (1981): Twinship as handicap: fact or fiction? In Gedda L, Parisi P, Nance WE (eds): *Twin Research: Part A, Psychology and Methodology*. New York: Alan R Liss, pp 57-62.
23. Wilson RS (1975): *Twins: Patterns of cognitive development as measured on the Wechsler Preschool*

and Primary Scale of Intelligence. *Develop Psychol* 11:126-134.

24. Zazzo R (1960): *Les Jumeaux: Le Couple et la Personne*. Paris: Presses Universitaires de France.

Correspondence: Dr. David A. Hay, Department of Psychology, La Trobe University, Bundoora, Victoria 3083, Australia.