Divergent Adaptive Strategies in the Acquisition of Developmental Skills in Children Who Are Blind

Focus : Achieving Quality in Education: Human Resource Development
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The developmental data in the present study draw on findings from our longitudinal developmental, intervention, and evaluation study of 10 congenitally blind children. At regular intervals over a period of 5 years, we visited these children and their families in their homes to carry out appropriate early intervention for the children together with their parents and also discuss childrearing or emotional issues with them (Brambring, 1996).

The aim here is to show clearly how the path of development in blind children diverges from that of their sighted peers. Divergent developmental data are analyzed according to an adaptive-compensatory approach postulating an alternative and specific path of development in the blind (Brambring, 2005; Ferrell, 1986, 2000; Jan, Freeman, & Scott, 1977). Following this theoretical model, the first thing is to ascertain when blind children have acquired each developmental skill and then to analyze the causes for the observable differences in development compared with sighted children. In other words, the approach examines strategies by which sighted and blind children acquire each individual skill. The goal is to determine the alternative strategies that blind children apply to solve tasks, and then to use this knowledge to derive blind-adequate recommendations for promoting their development.

Two examples will clarify these different paths of development and the alternative strategies blind and sighted children apply when solving tasks.

1. Sighted infants acquire the skill of "building a tower with three toy blocks" at about the age of 15 months; "normally developing" blind children, in contrast, not until about 29 months. The explanation for this difference is that sighted children learn the task under visual control and feedback conditions. They can see whether one block is sitting exactly on top of the one below it, and if the tower collapses, they quickly learn that this is because they have not positioned their blocks exactly enough. Without the possibility of visual control, blind children can only learn this task when they have "understood" that blocks have to be placed exactly on top of each other if a tower is to stay up. Hence, they have to solve this task cognitively, whereas sighted children solve it visually. Naturally, a cognitive solution requires a longer process of development, and this explains the developmental difference in mastering this task.

2. Sighted children can solve the task "find two identical objects in a set of five objects" at about 26 months; "normally developing" blind children, not until about 42 months. The reason for this difference is that sighted children can recognize and compare all five objects at a glance. It is a task that makes relatively low cognitive demands on them. Blind children, in contrast, have to carefully feel all five objects one after the other before they can identify which two are the same— a relatively advanced cognitive achievement. Therefore, we posited that one and the same task differs in task difficulty for sighted versus blind children because presentation is simultaneous versus

successive. We tested this hypothesis by spreading the five objects across five different but interrelated spaces. When faced with this successive presentation of the task, the 2- to 3-year-old sighted children performed no better than the blind children, and did not solve the task any earlier than they did. This example indicates the reason for the difference in the ages at which the two groups acquire this skill.

Both examples clarify the ways in which the demands imposed by the same developmental task may differ for blind and sighted children. The only way we are able to recognize these differences is by comparing the ages at which these two groups acquire a skill and analyzing the reasons for the divergence in development.

Even today, after decades of research and special education for children who are blind, we still do not know enough about the alternative paths of development they take during infancy and preschool age. The objective of this study is to make a small contribution to closing this knowledge gap by comparing the acquisition age for developmental skills in blind and sighted children.

We took the data from the Bielefeld longitudinal study (Brambring, 1993, 1999, 2004, in press), and selected 107 developmental skills for which age reports are also available from four developmental tests for sighted children (*Bayley Scales*, Bayley, 1969; *Griffiths Developmental Scales*, German version: Brandt 1983; *Denver Developmental Screening Test*, German version: Flehmig et al., 1973; *Entwicklungskontrolle in der frühen Kindheit,* Zwiener & Schmidt-Kolmer, 1982).

This comparison only used data from those in our blind group who were "developing normally." At the end of Bielefeld longitudinal study, the 10 participants were aged 5-6 years. An examination of their developmental trajectories, an intelligence test, and teachers' ratings (Brambring, 2005) allowed us to be sure that 4 of them were developing normally. Three of these four children were completely blind (microphthalmos, anophthalmos, and retinopathy of prematurity, stage V) and one possessed minimal light perception (Leber's amaurosis). We did not use data from the other blind children to ensure that any differences found between blind and sighted children would be due to blindness alone and not to other factors.

To ascertain and classify differences in development, we first tested how far the ages at which sighted and blind children acquired these skills overlapped in the 107 comparisons. We formed four categories: (a) *Extreme developmental delay* when the age of acquisition in blind children lies outside the norms for sighted children; that is, when all four blind children acquire the skill later than 95 % of sighted children. (b) *Strong developmental delay* when the age of acquisition in one blind child lies within the norms for sighted children, but the mean age for blind children is higher than that for 95 % of sighted children. (c) *Slight developmental delay* when the mean age of acquisition for blind children lies within the norm range for sighted children but is later than the sighted mean. (d) *Developmental advantage* when the mean age of acquisition in blind children is earlier than that in sighted children.

Table 1 reports the distribution of developmental differences between blind and sighted children on these 107 developmental skills across these four domains.

Table 1
Distribution of the 107 Developmental Skills

Developmental difference	Number of skills	%
Extreme delay	37	34.6
Strong delay	35	32.7
Slight delay	26	24.3
Developmental advantage	9	8.4
Total	107	100

Table 1 shows that blind children reveal developmental delays on the majority of skills. These delays are extreme for about one-third of the skills, strong for about one-third, and slight for about one-quarter. However, for nine skills (8.4 %), the mean age of acquisition was earlier in blind children. This classification indicates that there is no consistently parallel delay in development in blind compared with sighted children across all developmental skills.

Table 2 goes into more detail and reports the extent of developmental differences split according to four developmental domains. It shows that the majority of extreme and strong developmental delays in blind children are found in manual skills, daily living skills, and gross-motor skills. In contrast, delays are only slight in social and verbal skills, in which the blind occasionally even show an advantage.

Table 2
Developmental Differences Between Blind and Sighted Children Split Into Four Domains

Developmental domain	Developmental difference	
Manual and daily living skills (*n* = 33)	Extreme delay	(62.5 %)
	Strong delay	(34.4 %)
	Slight delay	(3.1 %)
Gross-motor skills (*n* = 29)	Strong delay	(52.0 %)
	Extreme delay	(32.0 %)
	Slight delay	(16.0 %)
Social-interaction skills (*n* = 14)	Slight delay	(46.2 %)
	Strong delay	(23.1 %)
	Developmental advantage	(15.4 %)
	Extreme delay	(15.4 %)
Language skills (*n* = 31)	Slight delay	(45.2 %)
	Developmental advantage	(22.5 %)
	Strong delay	(16.1 %)
	Extreme delay	(16.1 %)

Note. *n* = Number of tasks per developmental domain. Percentages are drawn on the subtotal in each specific domain.

For a number of reasons, it is not possible to gather comparative data on sighted versus blind children in all developmental domains. For example, there are no reports comparing spatial orientation— a fundamental developmental challenge for blind children. The reason is that developmental tests for sighted children usually do not contain any items on this domain. Although all developmental tests for sighted children contain items on cognitive development, these are generally assessed with pictorial materials or manipulative tasks— forms of presentation that are unsuitable for the blind. In our own study, most items for assessing cognitive abilities in blind children used auditory or tactile rather than visual materials. Any comparison would therefore be invalid because of the different forms of presentation.

Table 2 reports not only differences *between* developmental domains but also the variation *within* each developmental domain. Two examples will point out and analyze the reasons for differences in the age of acquisition *within* one developmental domain.

The manual developmental task of "beats a drum rhythmically with two drumsticks" reveals the most extreme delay in development in our comparison: Sighted children acquire it at circa 11.0 months; "normally developing" blind children, at circa 37.0 months. Mastery of this task requires an adequate use of tools (drumsticks), coordinated performance of alternating arm movements, and accurate hitting of the drum (spatial demand). All three components of this activity are learned through visual guidance, feedback, and imitation. However, blind children have to comprehend this task cognitively before they can perform it on the basis of verbal explanations and through having their hands guided from behind. Mastering this type of task requires a far more advanced cognitive development than the visual solution for sighted children, and this explains the extreme developmental delay in the blind.

Another manual skill, "wipes mouth or nose with cloth," in contrast, reveals only a slight developmental difference: Sighted children can do this at approximately 16.0 months; blind children, at approximately 23.0 months. This is a body-related act; that is, one's own body serves as the spatial reference point, evidently making it much easier for blind children to perform.

The second example comes from the verbal domain. On the skill "names three objects correctly when asked," the four blind children in our longitudinal study revealed a developmental advantage over sighted peers. On average, they could do this at 22.5 months compared with 24.0 months in sighted children. Probably, this developmental advantage can be explained through the special way in which mothers communicate with blind children (Campbell, 2003; Kekelis & Andersen, 1984; Kekelis & Prinz, 1996; Moore & McConachie, 1994; Pérez-Pereira & Conti-Ramsden, 1999). They use significantly more imperative phrases in order to draw their child's attention to objects in the environment. This type of verbal interaction probably encourages object naming.

In contrast, blind children show extreme delays in acquiring the possessive pronoun "my." They do not use it correctly until they are 36.5 months old— compared with 19.0 months in sighted children. Several studies have confirmed such a strong delay in the acquisition of personal and possessive pronouns (Fraiberg, 1977; Fraiberg & Adelson, 1973; Pérez-Pereira & Conti-Ramsden, 1999). The lack of vision seems to make it harder to distinguish between self and others. Sighted children learn this distinction through the visible separation of persons in space as well as the reciprocal exchange of eye contact and facial cues.

These findings confirm that the type of developmental differences found between blind and sighted children and the reasons for them are far more complex and differentiated than previously assumed. Of course, we can name developmental domains in which blind children show, on average, more extreme delays than in others. However, the variations *within* each developmental domain are so great that only a precise observation of each individual developmental skill will reveal the impact of congenital blindness on its acquisition.

The practical implications of these findings point to the need to get to know the complex pattern of different and strongly varying ages at which blind children acquire each developmental skill in order to promote their development at the appropriate time.

Finally, Table 3 uses the example of the age at which blind children acquire gross-motor skills to show the level of agreement between our research and other studies (Ferrell, 2000; Fraiberg, 1977; Norris, Spauling, & Brodie, 1957). This level of agreement is astonishingly high when we consider the long time intervals between our research and Fraiberg (1977) or Norris et al. (1957) and the accompanying changes in the medical and early intervention framing conditions of care for blind children and their families. Such consistency across time and cultures suggests that our findings are stable and representative. It also encourages us to assume that the other developmental data on approximately 350 skills from the Bielefeld Longitudinal Study reported in the observation scales (Brambring, 1999/in press) are also representative findings on the development of children who are congenitally blind.

Table 3
Comparison of Own Developmental Data With Other Studies

	Own study	Other studies	Sighted norm
Pulls up to standing position	13.0	13.0[1]	8.8
Walks holding onto one hand	15.0	15.0/18.0[2]	9.6
Walks along furniture	15.0	15.0[2]	9.7
Stands confidently	14.0/16.5	13.0[1] 18.0[2]	11.3/12.3
Walks alone at least 3 steps	16.5	15.25[1]	12.4
Walks alone at least 10 steps	18.0	19.25[1] 19.8[3] 24.0[2]	13.7
Climbs up steps, one step at a time	33.0	33.4[3] 30.0/36.0[2]	17.1

Note. 1 = Fraiberg (1977); 2 = Norris et al. (1957); 3 = Ferrell (2000). Reports in months. Two reports indicate that two similar skills were assessed.

Conclusion

The challenge for the future will be to increasingly improve and differentiate our understanding of the alternative paths of development in children who are blind. This would call for further studies applying the adaptive-compensatory approach to larger samples of blind children, as well as empirical analyses of the specific paths of development in blind children with additional impairments.

The basic idea in the present study that children with impairment show a specific path of development and that this needs to be taken into account during intervention is nothing new. The famous Russian developmental psychologist Lev S. Vygotsky (1896-1934) already formulated the need for this approach in 1920 – 1930 (individual publications)/1993 (collected works).

> *It is still absolutely necessary to take into account the specific developmental characteristics of a child with a defect. The educator must become aware of those specific features and factors in children's development which respond to their uniqueness and which demand it. From a pedagogical point of view, a blind or deaf child, may, in principle, be equated with a normal child, but the deaf or blind child achieves the goals of a normal child by different means and by a different path. …. A defect is not only a weakness but also a strength.* (pp. 58, 60)

References

Bayley, N. (1969). *Manual for the Bayley Scales of Infant Development*. New York: Psychological Corporation.

Brambring, M. (1993). *"Lessons" with a child who is blind. Development and Early Intervention in the first years of life.* Okemos, MI: Blind Children's Fund.

Brambring, M. (1996). Early intervention with blind children: Main findings of the Bielefeld longitudinal study. In M. Brambring, H. Rauh, & A. Beelmann (Eds.), *Early childhood intervention: Theory, evaluation, and practice* (pp. 419-435). Berlin, New York: de Gruyter.

Brambring, M. (1999). *Handbuch: Entwicklungsbeobachtung und -förderung blinder Klein- und Vorschulkinder: Beobachtungsbögen und Entwicklungsdaten der Bielefelder Längsschnittstudie*. Würzburg, Germany: edition bentheim.

Brambring, M. (2004). *Lo sviluppo nei bambini non vedenti. Osservazione e intervento precoce* (J. Lanners, Trans.). Milan: FrancoAngeli.

Brambring, M. (in press). *Bielefeld Observation Scales (BOS) and developmental data from the Bielefeld Longitudinal Study* (J. Harrow, Trans.). Würzburg, Germany: edition bentheim.

Brambring, M. (2005). Divergente Entwicklung blinder und sehender Kinder in vier Entwicklungsbereichen. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie, 37*(4), 173-183.

Brambring, M., Beelmann, A., Buitenhuis, S., Hecker, W., Kurp, C., Licher-Eversmann, G., & Müller, A. (1995). Frühförderung blinder Kinder. Konzeption und Hauptergebnisse des Bielefelder Projektes. *Kindheit und Entwicklung, 4*, 149-156.

Brandt, I. (1983). *Griffiths-Entwicklungsskalen (GES)*. Weinheim, Germany: Beltz (Original: Griffiths, B., 1954).

Campbell, J. (2003). Maternal directives to young children who are blind. *Journal of Visual Impairment & Blindness, 97*(6), 355-365.

Ferrell, K. A. (1986). Working with parents. In G. T. Scholl (Ed.), *Foundations of education for blind and visually handicapped children and youth* (pp. 265-247). New York: American Foundation for the Blind.

Ferrell, K. A. (2000). Growth and development of young children. In M. C. Holbrook & A. J. Koenig (Eds.), *Foundations of education. Volume I: History and Theory of Teaching Children and Youths with Visual Impairments* (2nd ed., pp. 111-134). New York: AFB Press.

Flehmig, I., Schloon, M., Uhde, J., & von Bernuth, H. (1973). *Denver-Entwicklungsskalen. Testanweisung*. Hamburg: Hamburger Spastikerverein.

Fraiberg, S. (1977). *Insights from the blind. Comparative studies of blind and sighted infants*. New York: New American Library.

Fraiberg, S., & Adelson, E. (1973). Self-representation in language and play: Observations of blind children. *Psychoanalytic Quarterly, 42*, 539-562.

Jan, J. E., Freeman, R. D., & Scott, E. P. (1977). *Visual impairment in children and adolescents*. New York: Grune & Stratton.

Kekelis, L. S., & Andersen, E. S. (1984). Family communication styles and language development. *Journal of Visual Impairment and Blindness, 78*, 54-65.

Kekelis, L. S., & Prinz, P. M. (1996). Blind and sighted children with their mothers: The development of discourse skills. *Journal of Visual Impairment & Blindness, 90*(5), 423-436.

Moore, V., & McConachie, H. (1994). Communication between blind and severely visually impaired children and their parents. *British Journal of Developmental Psychology, 12*, 491-502.

Norris, M., Spaulding, P. J., & Brodie, F. H. (1957). *Blindness in children*. Chicago, IL: University of Chicago Press.

Pérez-Pereira, M., & Conti-Ramsden, G. (1999). *Language development and social inter-action in blind children*. Hove, England: Psychology Press/Taylor and Francis (UK).

Zwiener, K., & Schmidt-Kollmer, E. (1982). *Entwicklungskontrolle in der frühen Kindheit in ihrer Bedeutung für die gesundheitliche Betreuung und die Erziehung*. Berlin: Volk und Gesundheit.

Vygotsky, L. S. (1993). *The collected works of L. S. Vygotsky: The fundamentals of defectology (abnormal psychology and learning disabilities)*. New York: Kluwer Academic.