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Chapter 7

Adaptive behavior and behavior problems in relation to academic achievement in children and adolescents with mental retardation

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Abstract

The interrelationship between behavior problems, adaptive behavior and academic achievement was studied in children with IQ's between 60 and 70. The objective was to increase the insight into the contribution of adaptive behavior and general and autistic behavior problems to academic achievement in children with mental retardation. Children from two levels of education were compared on adaptive behavior (VABS), general behavior problems (CBCL) and autistic behavior problems (ABC). The effect of behavior problems on adaptive behavior, and the causal relationships between behavior problems, adaptive behavior and level of education were investigated. In children from the highest level of mild mental retardation, adaptive behavior seems to be the most important factor that directly influences the level of education that a child attends. Autistic and general behavior problems directly influence the level of adaptive behavior. Especially the problems in the area of autism seem to have such a restrictive effect on the level of adaptive behavior that children do not reach the level of education that would be expected based on IQ. Implications of these findings for clinical practice are discussed.

7.1 Introduction

In mental retardation, three aspects are important: intelligence, adaptive behavior and age of onset (WHO, 1992; APA, 2000).

Within the population with mental retardation, the range of intellectual functioning is very wide. The IQ is therefore a broad indicator of the abilities and the general level of functioning: the higher the level of IQ, the higher the abilities of an individual.

However, on an individual level, IQ alone is not enough to describe the general level of functioning. It is then very important to consider the second aspect of mental retardation, e.g. the level of adaptive behavior. Adaptive behavior is defined as the performance of daily living activities required for personal and social sufficiency of a person (Sparrow, Balla, & Cicchetti, 1984). From a clinical perspective, insight into the level of adaptive behavior of a child or adolescent with mental retardation is of major importance both for the diagnostic process and for treatment, to develop and evaluate services, education or training.

Deficits in adaptive behavior affect the ability to reach a certain level of academic achievement. With a higher level of adaptive behavior a child will be more able to adjust to the demands of the school situation. According to Shelton et al. (1998) deficits in adaptive behavior, or adaptive disability as they name it, leads to vulnerability for academic failure and school disciplinary actions in the future. Shelton et al. examined pre-school children with normal IQ's and with aggressive and hyperactive-impulsive-inattentive behavior with and without an adaptive disability. Although all children in this study suffered from hyperactive-impulsive-inattentive behavior, only the ones with an adaptive disability were vulnerable for academic failure and school disciplinary actions. A recent study of Vander Stoep et al. (2002) showed that failure to complete school in normally intelligent adolescents seems to be predicted very well by the level of adaptive behavior of the adolescent. Not a psychiatric diagnosis as such, but the relatively simple count of symptoms or the level of adaptive behavior was the best predictor for failure in school.

Adaptive behavior is related to many factors, such as age, intelligence, specific syndromes and behavioral or psychiatric problems. Since adaptive behavior proceeds along a developmental trajectory there is a higher level of adaptive development as a child grows older (Loveland & Tunali-Kotoski, 1998). The relationship between intelligence and adaptive behavior is less clear-cut. Sparrow

and her colleagues found a modest correlation among typically developing children (Sparrow et al., 1984). Specific syndromes lead to specific patterns of adaptive behavior, as is the case in Fragile X syndrome (Dykens, Hodapp, Ort, & Leckman, 1993; Freund, Peebles, Aylward, & Reiss, 1995; Loveland & Tunali-Kotoski, 1998), Down syndrome (Rodrigue, Morgan, & Geffken, 1991; Loveland & Kelley, 1991; Dykens, Hodapp, & Evans, 1994; Loveland & Tunali-Kotoski, 1998), or Prader-Willi syndrome (Dykens, Hodapp, Walsh, & Nash, 1992; Loveland & Tunali-Kotoski, 1998). Specific patterns of adaptive behavior are also reported in individuals with behavioral or psychiatric problems. A well-known example of a specific pattern of adaptive behavior concordant with a specific psychiatric disorder is found in children with pervasive developmental disorders, PDD (Sparrow, 1997). Besides an overall lower level of adaptive behavior, the profile of children with mental retardation and a pervasive developmental disorder differs from that of children with mental retardation without a pervasive developmental disorder. The social aspects of adaptive behavior seem to be most affected, with lower scores for children with a pervasive developmental disorder, whereas there seems to be no effect on self-help or motor skills. Whether or not children with a pervasive developmental disorder have lower scores on communication skills depends on the control groups. Compared to language impaired children and children with Down Syndrome there is no difference, compared to other groups, children with a pervasive developmental disorder have lower scores on communication (Volkmar et al., 1987; Freeman, Ritvo, Yokota, Childs, & Pollard, 1988; Volkmar, Carter, Sparrow, & Cicchetti, 1993; Vig & Jedrysek, 1995; Carpentieri & Morgan, 1996; Carter et al., 1998; Kraijer, 2000; Liss et al., 2001).

In the present study, the interrelationship between academic achievement, adaptive behavior and behavior problems, or maladaptive behavior, was investigated. The main objective was to increase the insight into the factors that influence academic achievement in children with mental retardation. Insight into these relationships will be of major clinical importance with respect to increasing the possibilities of children who have high enough IQ's to achieve certain skills and reach a higher level of education, but who are restricted by other factors. Academic achievement was defined as the level of education a child attends, and adaptive behavior was measured with the Vineland Adaptive Behavior Scales, VABS (Sparrow et al., 1984). Two types of behavior problems were measured: problems in the area

of pervasive developmental disorders (social interaction, communication, stereotyped behavior) with the Autism Behavior Checklist, ABC (Krug, Arick, & Almond, 1980) and general behavior problems with the Child Behavior Checklist, CBCL (Achenbach, 1991). In a large, representative group of children within a small range of mild mental retardation, in two levels of education, we investigated the levels of adaptive behavior, the amount of general and autistic behavior problems and their individual contributions to academic achievement.

7.2 Method

Participants

The 186 participants in this study were selected from an epidemiological study in the total population of children and adolescents with mental retardation in the province of Friesland, in the northern part of the Netherlands (de Bildt et al., 2003b). The present study only included children who had IQ's from 61 through 70, attended special education, and were between 6 and 18 years old.

In the Netherlands there are two levels of special education for children with mental retardation: 'schools for children with mild learning problems', and 'schools for children with severe learning problems'. Of these two, the first type of school is the highest level of special education. The aim is that children achieve the objectives of general primary education, e.g. learn to read, write and arithmetic, by receiving additional support, adjusted to the specific needs of each child. Some objectives from general primary education have to be adjusted for these children, and some other objectives will not be achievable for them at all.

Children in the other type of school have severely restricted abilities with respect to learning due to their mental retardation, although they are able to participate in some form of education in a classroom setting. The objectives of general primary education are unachievable for these students, or can only partially be achieved. Therefore, aims in this type of school more often concern training of daily living skills and other basic skills. Children in this type of school receive many additional services and are often supported individually.

In theory, an IQ of 60 or below is the criterion to attend this second type of education, a school for children with severe learning difficulties. Nevertheless, in practice some children with an IQ higher than 60 are admitted. Although their IQ is too high for this school type, these children have severe difficulties in achieving the

objectives of general education and in participating in education at a higher level, resembling the problems of children with lower IQ's. Other factors than IQ seem to play a role in their ability to learn, and the level of academic skills they can achieve.

In the present study, 121 children attended the higher level of education and 65 children attended the lower level of education. Children in the two levels of education did not differ on IQ, age or sex. Characteristics of the participants are presented in table 7.1.

Table 7.1 Characteristics of the participants

Level of Education	<i>n</i>	IQ		Age		Sex			
		<i>mean</i>	<i>sd</i>	<i>mean</i>	<i>sd</i>	Male		Female	
						<i>n</i>	%	<i>n</i>	%
<i>Mild Learning Problems</i>	121	65.7	2.7	11.5	3.0	79	65.3	42	34.7
<i>Severe Learning Problems</i>	65	65.3	2.8	11.7	3.0	45	69.2	20	30.8

Instruments

Vineland Adaptive Behavior Scales (VABS)

The Vineland Adaptive Behavior Scales (Sparrow et al., 1984) is an internationally well-known interview for parents, measuring the adaptive behavior of a child. Adaptive behavior is measured over four domains: Communication (Receptive, Expressive and Written), Socialization (Interpersonal Relationships, Play and Leisure Time and Coping Skills), Daily Living Skills (Personal, Domestic and Community) and Motor Skills (Gross and Fine). Since the Motor domain is only applicable to children younger than 6, this domain was not included in the analyses. As recommended by Volkmar et al. (1987) age-equivalent scores of each domain and subdomain were examined.

Child Behavior Checklist (CBCL)

The Child Behavior Checklist is a widely-used parent-questionnaire with items on various problem behaviors, developed for children between 4 and 18 years old (Achenbach, 1991; Crijnen, Achenbach, & Verhulst, 1997; Schmeck et al., 2001). Although originally developed for typically developing children by Achenbach, it has also been used in children with lower levels of functioning (Bölte, Dickhut, & Poustka, 1999; Noterdaeme, Minow, & Amorosa, 1999). The CBCL items are grouped in eight

narrow-band scales: Withdrawn, Somatic Complaints, Anxious/Depressed, Social Problems, Thought Problems, Attention Problems, Delinquent Behavior and Aggressive Behavior. There are two broad-band scales, Internalizing (includes the first three narrow-band scales) and Externalizing (includes the last two narrow-band scales). In this study, the t-scores on the narrow-band scales, the broad-band scales and on the Total CBCL were used to investigate the interrelationship between general behavior problems, adaptive behavior and level of education.

Autism Behavior Checklist (ABC)

To investigate the role of pervasive developmental disorders on adaptive behavior and level of education, the ABC (Krug et al., 1980) was used. This instrument was developed for measuring autism and completed by parents in this study. For comparison of the two levels of education, total scores were analyzed.

Statistical Analyses

The mean age equivalents on the domains and subdomains of the Vineland and the total scores on the ABC and the CBCL were compared between children and adolescents in the two levels of education with Student's t-tests, when applicable, or with Mann-Whitney U tests when the distribution was not normal. The effect of behavior problems on adaptive behavior was investigated with a General Linear Model. To examine the role of each of the factors in level of education a logistic regression was applied (SPSS Inc., 1999). Finally, a path analysis model was constructed and tested to investigate the causal relationships between behavior problems, adaptive behavior and level of education (Muthén & Muthén, 1999).

7.3 Results

Adaptive behavior in two levels of education

Compared to the higher level of education, children in the lower level of education had significantly lower age equivalents on the VABS domain and subdomain scores, except for the Socialization subdomain Play and Leisure Time (table 7.2).

Table 7.2 Adaptive behavior (age equivalents in months) and behavior problems (total scores) per level of education

		Level of Education			
		Severe Learning Problems		Mild Learning Problems	
		<i>mean</i>	<i>sd</i>	<i>mean</i>	<i>sd</i>
VABS Communication	<i>Receptive*</i>	65.6	23.0	75.5	23.1
	<i>Expressive**</i>	76.0	31.1	91.7	31.6
	<i>Written**</i>	68.8	24.4	86.1	24.3
	<i>Total**</i>	70.4	20.0	87.2	23.2
VABS Daily Living	<i>Personal**</i>	80.6	22.0	98.4	29.5
	<i>Domestic*</i>	83.3	27.2	98.4	37.1
	<i>Community**</i>	81.3	30.8	102.6	38.2
	<i>Total**</i>	81.2	25.2	100.1	33.5
VABS Social	<i>Interpersonal**</i>	68.8	43.3	97.9	48.1
	<i>Play Leisure</i>	86.0	55.4	93.3	46.2
	<i>Coping Skills*</i>	92.1	44.5	112.1	50.7
	<i>Total**</i>	81.0	42.7	100.2	42.0
CBCL	<i>Total**</i>	34.3	22.8	26.1	21.6
ABC	<i>Total**</i>	28.3	20.6	19.0	20.8

* $p < .01$, ** $p \leq .001$

Behavior problems and adaptive behavior

The levels of education differed significantly with respect to both ABC total scores and CBCL total scores, with higher problem scores in the lower level of education.

To investigate the role of these behavior problems in adaptive behavior, the relationship between the total scores on the CBCL and ABC and adaptive behavior were examined, controlled for age, IQ and sex. With a General Linear Model, the effect of each factor on adaptive behavior can be examined, controlled for the others. As presented in table 7.3, the total score on the ABC had a significant effect on almost all domains and subdomains of the VABS, except the Communication subdomain Receptive. Additionally, the CBCL total score had an effect for the total VABS, the Socialization domain, its subdomains Interpersonal Relationships and Coping Skills and the Communication subdomain Receptive. Of the control factors, age was the only one with a significant effect on the age equivalents of the VABS.

The effects of ABC and CBCL total scores on the total age equivalent of the VABS differed between the two levels of education. With both questionnaires in the analysis and controlled for IQ, sex and age, the ABC had a significant effect in the lower level, the CBCL in the higher level of education.

Table 7.3 Effect of ABC and CBCL total scores on VABS age equivalents, controlled for age, sex and IQ

		ABC total score	CBCL total score
		F (df=185)	F (df=185)
VABS	Total	11.28***	4.81*
Age equivalents in months	Communication	6.55*	.96
	Receptive	.04	6.17*
	Expressive	5.21*	.40
	Written	6.90**	.16
	Daily Living	9.48**	1.84
	Personal	12.50***	1.50
	Domestic	4.55*	2.21
	Community	7.86**	.84
	Social	6.14*	4.37*
	Interpersonal	5.24*	7.01**
	Play and Leisure	4.18*	.08
	Coping	5.44*	5.90*
Higher level	VABS Total	1.12	4.57*
Lower level	VABS Total	4.59*	1.90

* $p < .05$, ** $p < .01$, *** $p = .001$

Adaptive behavior, behavior problems and level of education

To investigate the influence of the factors adaptive behavior, and ABC and CBCL total score on attending a certain level of education, a logistic regression was applied (table 7.4). The odds ratio's (OR) express the increase or decrease in the probability of attending the highest level of education, with increasing scores on CBCL and ABC or increasing age equivalents on the VABS, controlled for all the other variables included in the model. For example, with the increase of each month on the VABS age equivalent, the probability that the child attends the higher level of education is elevated by 5% (or is 1.05 times higher). The scores on the CBCL or the

ABC had no significant direct effect on the level of education. Of the control factors, sex and IQ had no effect. The effect of age on attending the highest level of education was significant, children of 12 and older have a lower probability to attend the higher level of education.

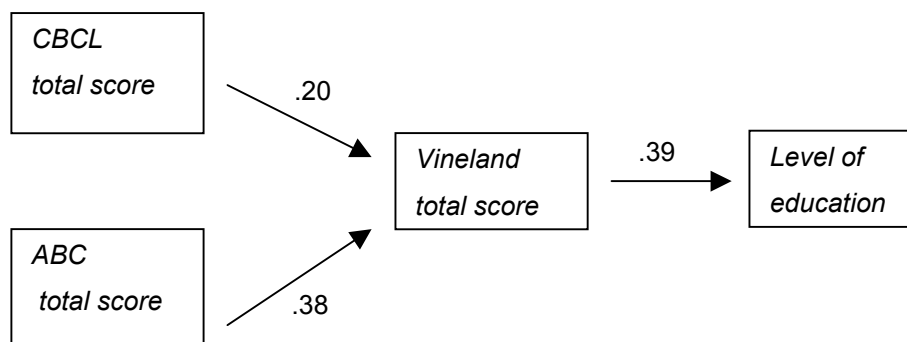
Table 7.4 Contribution of adaptive behavior and behavior problems to level of education

		Level of Education	
		Odds ratio	95% CI
VABS age equivalent		1.05*	1.02-1.07
ABC total score		.99	.97-1.01
CBCL total score		1.00	.98-1.02
Sex	Male	1.00	
	Female	1.19	.58-2.45
Age	< 12	1.00	
	≥ 12	.32*	.14-.71
IQ		1.07	.94-1.21

* $p < .01$

To explore the causal relationships between behavior problems, adaptive behavior and level of education in more detail, a path-analysis model for categorical and continuous dependent variables was constructed and tested, as shown in figure 7.1. This model represents a direct effect of the ABC and CBCL total scores on the VABS age equivalent, a direct effect of the VABS age equivalent on level of education and therefore an indirect effect of the ABC and CBCL on level of education. This model showed a satisfactory goodness of fit ($p = .46$).

Figure 7.1 Standardized regression coefficients of a path analysis model (goodness of fit: $\chi^2 = 1.5$, $df = 2$, $p = .46$)



7.4 Discussion

The present study investigated the relationship between behavior problems, adaptive behavior and academic achievement, to detect the most salient indicator of academic achievement, in a representative cohort of children and adolescents between 6 and 18 years with mild mental retardation (IQ 60-70). The results of the study may contribute to a better understanding of the influence of behavior problems on adaptive behavior, and the role of both in the level of education a child attends. From a clinical perspective, this insight may lead to specific services that enable individuals with mental retardation to reduce restricting factors and to achieve skills that are needed to adjust to a school type that matches their level of intelligence.

Academic achievement was defined as the level of education a child attends. Adaptive behavior was measured with the VABS, behavior problems in the area of pervasive developmental disorders with the ABC and general behavior problems with the CBCL.

The first objective of this study was to compare the two levels of education on adaptive behavior and on behavior problems. As expected, children in the higher level of education had significantly higher VABS age equivalents (except Play and Leisure Time) than in the lower level of education. Yet, the profile of adaptive behavior was the same in both groups. With respect to behavior problems, children in the higher level showed significantly lower problem scores on both ABC and CBCL. This indicates that, controlled for IQ, both behavior problems and level of adaptive behavior are related to the level of education that a child is able to attend.

Second, the interrelationship between behavior problems and adaptive behavior was investigated. The results show a considerable effect of the ABC total score on many (sub)domains of adaptive behavior for the total group, when both questionnaires are included in the analysis, controlled for age, IQ and sex. The CBCL has a smaller, but additional effect. This seems to indicate that behavior problems in the area of communication, social interaction and stereotyped behavior (e.g. the concept of pervasive developmental disorders) affect adaptive behavior to a larger extent than general behavior problems. Yet, the combination of problems in the area of pervasive developmental disorders and general behavior problems affects adaptive behavior even more. When behavior problems, or maladaptive behavior are taken into account as a domain of adaptive behavior, it is not surprising that these

problems have their influence on the level of adaptive behavior (Widaman, Gibbs, & Geary, 1987).

Nevertheless, it is surprising that the effects of behavior problems on adaptive behavior differ between the two levels of education. Problems in the area of pervasive developmental disorders seem to decrease the level of functioning in the lower level of education, whereas these problems do not play any role in the higher level. In that level, general behavior problems are more restrictive for the level of adaptive behavior of a child. These results imply that the adaptive behavior of children with severe problems related to pervasive developmental disorders is so much affected by these problems that they are not able to reach the higher level of education, which would be expected, considering their IQ. Therefore only children least affected by a pervasive developmental disorder will reach and profit from the higher level of education. In the higher level of education, general behavior problems affect adaptive behavior more than problems related to pervasive developmental disorders, however not to the extent that children are unable to attend this level of education.

The only question that remains is which of the factors adaptive behavior, autistic behavior problems or general behavior problems, is the central factor in the level of education that a child is able to attend. The results of this study show that the level of adaptive behavior has a significant effect on level of education, whereas the amount of behavior problems does not have any direct effect. This indicates that not the problem behavior in itself influences the level of education that would be expected based on IQ, but that the limited level of adaptive behavior, which results from the presence of problem behavior, is the most important factor.

Although the strength of the present study is the fact that the participants represented the total population of children with mild mental retardation (IQ between 60 and 70) between 6 and 18 years, the age range is very broad. However, since we aimed to increase the insight into the interrelationship between adaptive behavior and behavior problems for all schoolgoing children, we decided not to narrow the age range. Instead, the effect of behavior problems on adaptive behavior, and the effect of behavior problems and adaptive behavior on level of education was controlled for age. Even though age had a significant effect on adaptive behavior and on level of education, the effects of behavior problems and adaptive behavior were still considerably strong. The significant effect of age on adaptive behavior is not

surprising, since the level of adaptive behavior increases with age. The significant effect of age on level of education can probably be explained by the fact that children with this level of intelligence all start school in the higher level of education, but that children with the most severe behavioral problems do not manage to keep up, and move down a level after a while (see also Kraijer, 1997).

In conclusion, the outcomes of the present study corroborate that adaptive behavior is of major importance for academic achievement, as was shown earlier in children with normal intelligence (Shelton et al., 1998; Vander Stoep et al., 2002). Moreover, in the population of children from the highest level of mild mental retardation, adaptive behavior seems to be the only factor that directly influences the level of education that a child reaches. However, behavior problems related to pervasive developmental disorders and general behavior problems directly influence the level of adaptive behavior. Especially the problems in the area of pervasive developmental disorders seem to have such a restrictive effect on the level of adaptive behavior that children do not reach the level of education that would be expected based on IQ.

For clinical practice, the present study contributes to the insight into the relationship between behavior problems, adaptive behavior and academic achievement. Although most schools have guidelines for the level of intellectual functioning that a child needs to meet to qualify for the level of education provided by that school, evaluation of the level of adaptive behavior should be an essential part of the admittance procedure. Additionally, behavior problems, especially in the area of pervasive developmental disorders, should be investigated. With respect to treatment services, increasing adaptive skills should be considered in combination with reducing behavior problems, especially problems related to pervasive developmental disorders, since these heavily interfere with the level of adaptive behavior.

