Vineland Screener 0–12 years research version (NL). Constructing a screening instrument to assess adaptive behaviour

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Abstract

In Western countries the need to assess the adaptive behaviour of a wide range of individuals within the framework of research and policy-making has increased in recent years. To meet this need a screener version of the Vineland Adaptive Behaviour Scales (VABS) was developed in the Netherlands. This screener is a questionnaire to be filled out by primary care-givers. Using a limited number of items the instrument covers the four domains of adaptive behaviour portrayed in the original Expanded Version of the VABS.

In this article the psychometric characteristics of this screener are determined in a non-clinical population of children from 0 to 12 years using a sample of 984 children.

Available data support the reliability and validity of the screener. Internal consistency of the domains and test-retest reliability are high: 0.90 or more. High intra-class correlations between scores of mothers and fathers show that inter-rater agreement is also satisfactory. Furthermore the domain scores contribute evenly to the composite score. The associations with chronological age/calendar age are strong. Correlations range between 0.80 and 0.95, implying that an increase in age linearly is related to an increase in adaptive behaviour. Newly born children obtain virtually no scores, and increase of scores levels off at different ages near the end of the intended age range. The results indicate that the screener is a promising research instrument to assess the adaptive behaviour of children by means of a short questionnaire filled out by their primary care-givers. Copyright © 2009 John Wiley & Sons, Ltd.

Introduction

Conceptualization of “adaptive behavior” has become very important in the last decade, mainly since the 1992 definition of mental retardation by the American Asso-

ciation on Mental Retardation (AAMR, 1992). The American Association on Mental Retardation (AAMR 2002, p.14) and the American Association on Intellectual and Developmental Disabilities (AAIDD, 2008) define

adaptive behaviour as “the collection of conceptual, social and practical skills that have been learned by people in order to function in their everyday lives”.

In the Netherlands changes in the educational system and the financing of care also call for objective instruments to assess adaptive functioning, in addition to intelligence and disability measures. There is no Dutch instrument available to assess adaptive behaviour over a wide range of people, both with and without developmental problems. The authors decided to translate and adapt the Vineland Adaptive Behavior Screener (Sparrow *et al.*, 1993; Sparrow *et al.*, 1984) for the Dutch-speaking population. The new instrument, a questionnaire that can be filled out by parents and/or primary care-givers, is intended for assessment of large groups, for the purpose of research and policy-making.

The different versions of the Vineland Adaptive Behaviour Scales (VABS) (Sparrow *et al.*, 1984) are widely used for both individual diagnostic purposes and research. With the exception of the classroom version, trained professionals administer the scales by means of an interview. This forms a major drawback for its use in large-scale research. Sparrow *et al.* (1993) also developed four screeners, which are used mainly for telephone interviews. These so-called Yale Vineland Screeners are often used for research purposes. For example, Beecham *et al.* (2002) used the screeners in a study to determine the needs of children with learning disabilities, while Rosenberg *et al.* (2006) used the screeners to estimate the rates of developmental delays in a national sample of children. However, they were never officially published. Moreover, each covers only a small (developmental) age range, for example 0–2 years and 11 months; 3–5 years and 11 months, etc. This is a problem, especially for research into groups of individuals with developmental disorders and a wide developmental range, e.g. people with autism, mental retardation or a chromosomal disorder.

Recently Sparrow *et al.* (2005) published the Vineland II, which encompasses four forms. One of them, the parent/caretaker rating form, is also intended for use as a questionnaire. However, that form contains 383 items and it takes, according to the authors, 30 to 60 minutes to complete. In our opinion it therefore cannot replace a screener version.

Method

Translation and construction

Since 1995 a Dutch translation of the expanded version of the VABS has been available (Research Group Developmental Disabilities, Leiden University). The items of

the VABS as well as their accompanying instructions were translated into Dutch and subsequently translated back into the language of origin and approved by the original authors.

Items from the different screening versions were combined. A relatively small number of items were excluded since they lacked virtually all variance. After deleting the overlapping items, the Vineland Screener for the age range 0–12 years consisted of 90 items.

The structure of the expanded version was maintained, so the items were arranged according to scale (e.g. Communication, Daily Living Skills, Socialization, Motor Skills). Subsequently the order of the items was determined by their relative difficulty within the scale, the most difficult items were being placed at the end. Most of this was carried out in a research project to develop Dutch norms for non-clinical and clinical groups assessed by a version of the Vineland Screener for children aged 0–6 years (Scholte *et al.*, 2008).

Sample

The data were collected in 2005 and 2006. Warranting a regional distribution as well as a distribution over large and small cities and rural areas, elementary schools and daycare centres/kindergartens throughout the Netherlands were selected. Of the parents that were subsequently invited to participate, parents of 984 children (57%) agreed. This remaining sample was dispersed across the Netherlands in the same way as the original sample.

The children aged 0–12 years [mean = 5.8 years, standard deviation (SD) = 3.42 years]. To acquire test–retest reliability characteristics, a random sample of half of the families that agreed to cooperate were invited to fill out a second form after a two-week interval ($n = 425$). The other random split half was used to acquire inter-rater reliability characteristics: both parents were invited to fill out a form simultaneously yet independently ($n = 538$).

To a large extent Dutch children under the age of four visit some sort of care centre for at least one or more mornings or afternoons per week. Dutch primary schools have eight groups; children start in Group 1 at the age of four. Dutch children are legally obliged to attend school after their fifth birthday, but virtually all start at the age of four. They leave primary school after finishing Group 8, around the age of 12 years. Boys (51%) and girls (49%) are evenly distributed in this sample and in most cases (91%) they live with both biological parents. Some 9% of the children live with one biological parent, in some cases in the company of a new partner. Nine per cent of the

children have at least one parent born outside the Netherlands; 56% of the parents received a higher education.

Procedure

After consenting, parents received the questionnaire from the schools/daycare centres and were asked to fill it out. The 90 items in the questionnaire cover the four domains: Communication ($n = 26$), Daily Living Skills ($n = 23$), Socialization ($n = 23$) and Motor Skills ($n = 18$), as do the other versions of the VABS.

Each item can be coded as: 2 = "yes, usually", 1 = "sometimes or partial", 0 = "no, never" or (DK) "don't know" as in the original VABS. A decision had to be made concerning the scoring of DK. In the interviewer edition this is recoded as "1", e.g. "sometimes or partial", but the interviewer is instructed to use this score prudently. In this study every DK score is recoded as "1" since there is no interviewer who has additional information on the child. Research assistants checked all questionnaires to make sure they were filled out correctly. Questionnaires (49) with more than three items left blank or coded DK were removed from the dataset. Another eight forms were excluded because their coding was highly suspicious: high scores in the domains in relation to calendar ages under six months.

Item characteristics were investigated, since the sample at hand consists of a relatively homogeneous group, e.g. children attending daycare, kindergarten or regular elementary schools. The variance of items is expected to be somewhat limited. Ceiling effects on a scale occur when a considerable number of subjects are scoring at, or close to, the 100% performance level of a test (Helms *et al.*, 2004). Similarly floor effects can occur close to the 0% performance. With Helms we choose as a criterion the 95% level. At those levels mean scores of a sub-sample can hardly decrease respectively increase. Only the number of individuals that not yet reached maximum or minimum performance can change.

In order to determine the reliability of the adaptive behaviour domains in this sample, the internal consistency coefficient alpha was computed. Alpha was computed for both the four developmental domains and the adaptive behaviour composite (ABC) score. In addition alpha was computed for boys and girls separately and for different age groups.

The level of agreement between two primary caregivers is an important issue when constructing an instrument that has to be filled out by one of them without the guidance of a professional. To gain insight into this matter, intra-class correlations (one way random effects)

were computed. When pairs of observations do not have an obvious order, intra-class correlations are preferred (Shrout and Fleiss, 1979; Griffin and Gonzalez, 1995; McGraw and Wong, 1996).

Adaptive behaviour should be stable over a short time interval. Within a 14-day period no substantial progress is expected in the performance(s) of the child. At the same time this period will be long enough to compensate for memory effects. Therefore a test-retest approach is appropriate (de Gruijter and van der Kamp, 2008). The events assessed are either visible or absent in every day life situations and are thus relatively straightforward to code. The second assessment is therefore expected to be highly similar to the first.

Factor analysis [Principal Component Analysis (PCA)] was performed in order to establish whether the description of "a proper developmental scale that encompasses four developmental domains" is justified. Also analyses were carried out to check whether the scores for the different domains contribute evenly to the composite score.

Results

Item characteristics

The very young children in this sample have not yet mastered (m)any of the adaptive skills probed by the various items of the instrument. In particular the domains "Communication" and "Daily Living Skills" show that virtually no children six months and younger obtain a score on one or more of the items in these domains (Table 1). A vast majority of the children up to six months obtain a zero score and the mean score lies within 5% of zero.

The means of the domains Socialization and Motor Skills lie at or above the 5% line from zero; four out of five children in this age group obtain a score that deviates from zero (skewness 0.77 and 1.08). As the age of the children increases the scores for the domains grow rapidly and their distribution becomes relatively normal.

For Motor Skills there is a considerable lack of variance of many of the items, as children grow older. From the age of four a marked decrease in range and standard deviation is seen. At six years, the mean scores have reached a level that exceeds 95% of the maximum score that can be reached for the domain, 40% of the children aged six years obtain the maximum score of 36, indicating that they have mastered all skills probed. At the age of 12 years 87% have reached this maximum.

After the age of 10, mean scores for the domain Communication exceed 95% of the absolute maximum. Here also the range is restricted: 50% of these 12-year-olds obtained the maximum score of 52.

Table 1 Descriptives Vineland Screener of 0–12-year-old non-clinical group (*N* = 984)

Age	<i>N</i>	Communication			Daily Living Skills			Socialization			Motor Skills			ABC(4)		
		Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>
0	44	00–01	0.2	0.2	00–01	0.1	0.4	00–06	1.9	1.5	00–04	1.5	1.2	00–09	3.8	2.1
1	88	00–14	2.8	3.2	00–08	1.1	1.7	00–12	6.0	2.7	01–25	8.1	4.5	04–49	18.1	10.4
2	88	02–24	13.9	5.3	00–21	9.3	4.4	04–27	13.2	5.7	06–28	18.8	4.4	20–95	55.3	16.4
3	87	00–29	21.1	4.5	01–28	16.9	6.0	09–36	19.8	5.5	07–33	25.2	4.1	39–119	57.9	13.4
4	83	12–31	24.5	3.6	03–36	23.9	5.8	10–41	24.9	5.9	19–36	29.0	4.0	44–137	102.2	16.2
5	90	18–44	28.4	4.0	20–40	29.5	3.9	17–44	31.4	5.6	24–36	33.1	2.5	90–155	122.5	12.1
6	83	22–47	31.5	5.0	25–40	32.4	3.6	22–45	33.0	4.6	29–36	34.7	1.6	114–160	131.6	10.6
7	96	28–49	40.8	4.2	29–44	35.5	2.9	24–45	36.2	4.0	29–36	35.1	1.2	127–170	147.6	8.9
8	62	33–52	44.6	4.4	30–44	37.0	3.0	26–46	38.0	4.6	26–36	35.4	1.6	121–175	154.9	9.7
9	81	35–52	46.8	3.5	31–44	38.7	2.6	30–46	39.4	3.3	31–36	35.4	1.2	140–176	160.3	6.8
10	78	39–52	48.8	3.3	33–45	40.1	2.8	29–46	40.1	4.0	26–36	35.6	1.4	139–177	164.5	8.7
11	52	46–52	50.4	1.6	33–45	40.9	2.6	32–46	41.0	3.4	32–36	35.6	1.0	155–179	167.9	5.7
12	52	27–52	50.1	3.9	29–46	41.3	2.9	32–46	40.5	3.9	31–36	35.8	0.8	129–179	167.6	9.0

Age: 0 = 6 months or younger, 1 = 6–18 months, 2 = 18–30 months, etc. ABC(4) = composite score including Motor Skills.

With respect to the domains Daily Living Skills and Socialization, mean scores for the 12-year-old do not reach 95% of their maximum, although the distribution of Daily Living Skills is markedly skewed (skewness -1.95).

Reliability and validity

A reliability analysis was performed using SPSS, computing Cronbach's alpha. This was done for the ABC as well as for the domain scores. For the ABC(3) score Motor Skills were excluded (Table 2). In addition alphas were computed for different sub-samples. Alphas for the total sample as well as for boys and for girls separately are well above 0.90, reflecting excellent clinical significance (Cicchetti, 1994), not only on the composite score but also on the domains. Reliability coefficients for boys and girls show virtually no difference. However on all domains reliabilities for the older children are lower than those for the younger groups. As far as sub-samples of children older than six years are concerned, coefficients decrease substantially; for Daily Living Skills, Socialization and Motor Skills in particular, the coefficient drops under 0.70 thus reflecting poor clinical significance. The composite score reliability coefficients for these sub-samples remain well above 0.80 (good clinical significance).

With the exception of the domain Communication the other domains exhibit quite low internal consistencies as far as the two older age groups (6–9 and 9–12 years) are concerned. For these older groups the domain Motor Skills has a large number of items with almost no variance as already indicated. The domains Daily Living Skills and Socialization also show limited variance for a substantial

number of items, although most children have not achieved the theoretical maximum for these domains. It turns out that for the two older groups inter-item correlations drop considerably within all domains, thus reducing the reliability coefficients for these age groups.

Inter-rater reliability

The scores of fathers and mothers correlate fairly well for the ABC and the domains (Table 3). Relatively small differences were found in the correlations with the total sample when boys and girls are looked at separately. According to the clinical criteria suggested by Cicchetti (2001) and Cicchetti and Sparrow (1981) these intra-class correlations all are considered excellent. When the age groups are looked at separately, it appears that for the two older age groups, intra-class correlations (ICCs) decrease in all domains and consequently also in the composite score. Since scores on the domains correlate closely with chronological age, restrictions in range found in the older groups are responsible for the decrease in the correlation coefficients here. In the older age groups the ICCs range from 0.44 to 0.78, (and thus can be considered "fair")¹ with the exception of the ICC of 0.39 for Socialization. However, regarding this domain the calculation of an ICC is meaningless due to the ceiling effect.

The decrease of the correlations is particularly pronounced for the domain Socialization. Inspection of differences in score between pairs of parents indicates that some parents differed in their opinion somewhat more in the domain Socialization compared to the other domains. Eighty per cent of the pairs exhibited a difference in score

Table 2 Internal consistency (Cronbach's alpha)

	Group			Number of items
	Total 984 ^a	Male 498	Female 476	
Communication	0.97	0.97	0.98	26
Daily Living Skills	0.97	0.97	0.97	23
Socialization	0.96	0.96	0.97	23
Motor Skills	0.96	0.96	0.97	18
ABC(3) ^b	0.99	0.99	0.99	72
ABC(4)	0.99	0.99	0.99	90

^aFor 10 children sex is unknown.

^bMotor Skills not included.

Table 3 Intra-class correlations between parents (*n* = 538)

	Group		
	Total 538	Male 271	Female 267
Communication	0.97	0.97	0.98
Daily Living Skills	0.96	0.96	0.96
Socialization	0.92	0.91	0.92
Motor Skills	0.96	0.97	0.96
ABC(3)	0.97	0.96	0.97
ABC(4)	0.98	0.97	0.98

^aMotor Skills not included.

¹Cicchetti (2001) ICC < 0.40: poor clinical significance.

of less than eight score points. For the domain Socialization this was 11 score points.

Test–retest

Table 4 shows the intra-class correlations found for the total group and for boys and girls. Test–retest coefficients (ICCs) vary between 0.90 and 0.96 for the domains. For the ABC composite score the coefficient is 0.95 and 0.96, respectively, depending on whether domain Motor Skills is included or not. When the sample is divided according to sex, coefficients hardly change. However, when the sample is divided into sub-samples based on age, thus becoming more homogeneous, considerable differences in the strength of the correlations are found. Again: restrictions in age range lead to a decrease in correlation.

Factor analysis

PCA was carried out in order to find out whether the factor structure supports the assumption that adaptive behaviour is a valid construct comprising the four domains “Communication”, “Daily Living Skills”, Socialization” and “Motor Skills”. High correlations (Table 5) are found between the four domains, resulting in a PCA solution on the four domain scores that shows an eigenvalue of 3.85 for the first component. A percentage of 94.4% of the ABC(4) is explained by the domain scores.

Apart from the PCA of the four domain scores, PCA analyses of the items of each individual domain were also carried out (Table 6). The analyses on the items of the separate domains indicate that each of the domains can be characterized satisfactorily as a single factor. All items that determine the first component load substantially on that component. Furthermore, compared to the first component, the second component in the initial solution shows a distinct decrease in eigenvalues.

Discussion

Assessment of adaptive behaviour by means of the interview editions of the VABS is time-consuming because of the way data are collected and the number of items to be coded. Triggered by the need to assess adaptive behaviour for research purposes, it was decided to develop a short screening instrument, an adaptation of the VABS, which

Table 4 Intra-class correlations: test–retest ($n = 425$)

	Group		
	Total 425 ^a	Male 218	Female 200
Communication	0.96	0.96	0.97
Daily Living Skills	0.95	0.94	0.95
Socialization	0.91	0.91	0.90
Motor Skills	0.90	0.90	0.89
ABC(3) ^b	0.96	0.95	0.96
ABC(4)	0.95	0.95	0.96

^aFor seven children sex is unknown.

^bMotor Skills not included.

Table 6 PCA one-factor solutions for four domains of Vineland Screener ($N = 984$)

	Eigenvalue	Percentage of variance	KMO
Communication	15.700	60.4	0.97
Daily Living Skills	13.946	60.6	0.98
Socialization	12.885	56.0	0.98
Motor Skills	11.375	63.2	0.97

Note: Bartlett's test of Sphericity for all solutions significant.

KMO: Kaiser, Meier, Olkin measure of sampling adequacy.

Table 5 Correlation between age (in months) and domain scores ($N = 984$)

	Age	Communication	Daily Living Skills	Socialization	Motor Skills
Communication	0.95				
Daily Living Skills	0.91	0.95			
Socialization	0.88	0.93	0.95		
Motor Skills	0.80	0.88	0.92	0.91	
ABC(3) ^a	0.93	0.98	0.99	0.98	0.92
ABC(4)	0.92	0.97	0.99	0.98	0.95

^aMotor Skills not included.

can be filled out by a parent or primary care-giver, provides sufficient and reliable information concerning the adaptive behaviour of children, and, at the same time, can be used efficiently in large-scale research situations. In other words: a short questionnaire-type Dutch adaptation of the screener versions earlier developed by Sparrow *et al.* (1993). The selection and the translation of the items, as well as the construction of the domains, are based on what Sparrow *et al.* (1993) consider to be the core items of the domains of the original instrument. These domains, in turn, are considered to be a good representation of the definition given by the AAMR (2002) for adaptive behaviour.

The Vineland Screener is meant to elicit information on the developmental process of individuals in four domains. Combined, domains should give information about the adaptive (behavioural) level of individuals. This implies that older children should reach a higher score on the ABC scale than younger children. This proved to be the case. It is clear that the scores for all domains show a similar increase with age. Correlation coefficients between age in months and domain scores are very substantial.

The increase in the domain scores levels off at different ages. Towards the top end of the age categories the increase diminishes as the theoretical maximum of the scale is reached. For the domain Motor Skills this happens when children reach the age of six. This finding is in line with the fact that in the Survey and Expanded Versions (Sparrow *et al.*, 1984) Motor Skills is only intended for use up to the age-equivalent of six years (calendar age). Up to the age of nine years the increase in domain scores for Daily Living Skills and Socialization is fairly marked, subsequently it decreases considerably although technically there is still room for an increase. Scores for Communication show a marked increase around the age of six. This particular increase can be explained by the fact that Dutch children start to receive formal training in reading and writing at school at the age of six. A considerable number of items in this domain relate to either reading or writing skills. At the age of 11 most children appear to have reached the maximum score for the domain Communication.

The screener is intended for the age range 0–12 years. The results reported here are based on a non-clinical sample, which we believe represents the normal adaptive development of children between 0 and 12 years. It is not certain that clinical groups will show the same pattern. However, item characteristics for this sample indicate that at a certain age virtually all (normal) children have mastered most of the adaptive skills requested. As far as very young children are concerned, it has become clear

that the development of adaptive behaviour can only be measured with this instrument starting from approximately six months.

The reliability of the domains and the ABC can be considered high. The high reliability of the ABC is irrespective of the exclusion of Motor Skills from the composite score. When looking at the entire sample, the reliabilities found for the ABC score and the domains correspond with those reported for the American Classroom Edition². However, while the means of the domains increase with age, the mean inter-item correlations decrease with age. Reliability coefficients computed for the sub-samples of older children decrease substantially. For these two sub-samples the domains Daily Living Skills, Socialization and of course Motor Skills are no longer reliably measured.

Mothers and fathers agree closely on the skills their child has or has not yet mastered. Their view of the child's abilities is consistent. These findings apply to the composite score as well as the domain scores. However, analogous to the reliability coefficients, with the increase in age a decrease in intra-class correlations between parents is found for sub-samples of all domains. For the domains Daily Living Skills and Socialization the decrease is particularly substantial. This is a matter of serious concern, since in most research situations information will originate from only one parent. Although many parents show a large degree of agreement, evidence is found that in some cases parents exhibit a considerable difference in their judgment of the developmental skills of their child, especially for the domain Socialization.

Test–retest correlations for the sample are 0.90 or more, though they drop when the sample is split on the basis of age and the sub-samples thus become more homogeneous. The correlations presented here suggest that test–retest reliability is fairly good.

Finally, PCA analysis shows that the domains can be viewed as single factors. Domain scores correlate closely with each other, a PCA on the domains results in a satisfactory single component that can be described as “adaptive behaviour”.

The concept of adaptive behaviour implies a change with age. When dealing with a norm group from 0 to 12 years a strong linear relationship between the subject's

² See <http://ags.pearsonassessments.com/assessments/technical/Vineland.asp> [1 November 2007]; *Classroom Edition*: Coefficient alpha means for domains 0.80 to 0.95; for Adaptive Behavior Composite 0.98.

calendar age and his scores on the adaptive behaviour scales is found. The domains show a decrease in change with age at a different age level for the separate domains. The domain Motor Skills clearly reaches a ceiling at the age of six. At the age of 11 most children have obtained the maximum score for the domain Communication. For the domains Daily Living Skills and Socialization it looks as if the development of most children, as is measured with the Vineland Screener 0–12, comes almost to a standstill when they reach the age of nine or ten. Up to approximately the age of 12 the Vineland Screener provides us with a practical indication of the adaptive functioning of children in relation to their age. The results described here demonstrate clearly that it will be worthwhile to develop norms for this instrument based on this sample of non-clinical Dutch children.

Declaration of interest statement

The authors report no competing interests.

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