New Age Levels of the Reynell-Zinkin Developmental Scales for Young Children with Visual Impairments

Mathijs P. J. Vervloed, Jo H. M. Hamers, Marion M. van Mens-Weisz, and Hanneke Timmer-Van de Vosse

Abstract: This article describes new developmental age levels and some psychometric properties for the Reynell-Zinkin scales for young children with visual impairments. Besides the standard error of measurement, psychometric properties are available on item variation, scale reproducibility, and internal consistency. The usefulness of age levels of the Reynell-Zinkin scales is discussed in relation to the aim of the scales, which is to have guidelines for assessment and developmental advice.

The manual for the Reynell-Zinkin Developmental Scales for Young Visually Handicapped Children—Part 1, Mental Development (hereafter called the Reynell-Zinkin scales) (Reynell, 1979)—was based on two articles that described the theoretical foundation of the scales (Reynell & Zinkin, 1975) and the course of development of children with visual impairments (those who are blind or have low vision; see Reynell, 1978). The Reynell-Zinkin scales consist of six subscales: social adaptation; sensorimotor understanding; exploration of the environment; response to sound and verbal comprehension; vocalization and expressive language structure; and expressive language, vocabulary, and content. Three subscales, containing about 60% of the items, are concerned with language development. The preponderance of items on language was probably due to Reynell’s earlier work on language development (Reynell, 1969; see also Reynell & Huntley, 1987).

According to Reynell (1979, p. 11), the aim of the Reynell-Zinkin scales is “to enable professional people, concerned with young visually handicapped children, to have some guidelines for assessment and developmental advice.” Furthermore, she noted that the scales serve as “a guide to the developmental stages the child has reached, and the progression of subsequent stages, so that appropriate early teaching may be given” (p. 11). Because of this functional relationship between assessment and intervention, the scales are a useful tool in early intervention activities with children who are visually impaired (see, for instance, Ferrell, 1986; Tobin, 1994).

The authors thank Marjon Vink, Jan van der Burg, Yvonne Kootjman, and Marie Louise Strauss, former staff members of the Department of Early Intervention, Bartiméus Foundation, for their help in gathering the data. Special thanks go to John van den Bercken for his statistical advice.

Accepted October 12, 1999.

The University of 69, Tucson, AZ
There are, however, some limitations to the use of the subscales. First, the instructions for administering and interpreting the test items are inadequate. Second, the developmental steps between two items in the subscales are often large. For instance, passing one extra item can sometimes lead to a credit of three to six months in developmental level. Third, there are no subscales for some other important developmental domains for children with visual impairments, such as motor, postural, and social development. Fourth, the content validity of some of the subscales is questionable because these subscales consist of heterogeneous items. For example, the social adaptation subscale has social items (like smiling and awareness of strangers) and items measuring skills of daily living (such as drinking from a cup that is held and eating with a spoon). The scale exploration of the environment more or less measures motor development (such as climbing stairs) and spatial orientation (like finding a door).

Finally, the only known data on reliability and validity of the Reynell-Zinkin scales were presented by Dote-Kwan (1995). The internal consistencies in Dote-Kwan’s study, measured by Cronbach’s alphas, ranged from .85 to .97 for the total scale and the subscales. The total score of the Reynell-Zinkin scales correlated strongly ($r = .95, p < .001$) with the results of the Maxfield-Bucholz test (1957), which was administered concurrently. According to Reynell (1979, p. 11), she did not conduct reliability studies “because [of] the nature of the tests, the difficulties of achieving any sort of standardization, and the profile type of scoring which does not lend itself to this sort of statistical analysis.” Although no psychometric data were available, Reynell (1979) stated that the age scores may be useful as an indication of individual rates of progress and specific areas of difficulty at any stage and can be used to compare the rate of development of a particular child with that of others in a comparable visual category.

However, to be able to use the Reynell-Zinkin scales as Reynell (1979) intended, one must know some psychometric properties of the scales. As a first step in determining these properties, the authors constructed new developmental age levels for three reasons. First, they wanted to use a methodologically more advanced design than the combination of a cross-sectional and a longitudinal design that Reynell (1978) used in her study. Some of the 109 children in that study were tested two to seven times, whereas 65 children were tested only once. Testing some, but not all, children more than once can lead to a severe bias in the final age scores (see Kirk, 1995). Second, the authors wanted to design an assessment instrument that could indicate the developmental level of an individual child without a researcher having to administer a social maturity scale first, as Reynell did with her sample (see also Dote-Kwan, 1995; Dote-Kwan & Hughes, 1994; Dote-Kwan, Hughes, & Taylor, 1997; Ferrell, 1986). Furthermore, the scale used by Reynell was an adaptation of the Vineland Social Maturity Scale, namely, the Social Maturity Scale for Blind Preschool Children (Maxfield & Bucholz, 1957). This scale, however, was not standardized for low vision children but only for legally blind children, that is, those with visual acuities of less than 6/60 (20/200). Third, the authors had the clinical impression that the age norms of the Reynell-Zinkin scales overestimated the age of children who actually in the cohort seemed to be developmentally from the Reynell-Zinkin scales.

On the basis of this study (see Timmer-Van de Vosse, Van Mens-Weisz, 1997), the second goal was to design a developmental age level scales for children who can compare these levels with other scales. In this article, some psychometric properties of the Reynolds-Zinkin scales were presented. Although no psychometric data were available, the authors stated that the age scores may be useful as an indication of individual rates of progress and specific areas of difficulty at any stage and can be used to compare the rate of development of a particular child with that of others in a comparable visual category.

However, to be able to use the Reynell-Zinkin scales as Reynell (1979) intended, one must know some psychometric properties of the scales. As a first step in determining these properties, the authors constructed new developmental age levels for three reasons. First, they wanted to use a methodologically more advanced design than the combination of a cross-sectional and a longitudinal design that Reynell (1978) used in her study. Some of the 109 children in that study were tested two to seven times, whereas 65 children were tested only once. Testing some, but not all, children more than once can lead to a severe bias in the final age scores (see Kirk, 1995). Second, the authors wanted to design an assessment instrument that could indicate the developmental level of an individual child without a researcher having to administer a social maturity scale first, as Reynell did with her sample (see also Dote-Kwan, 1995; Dote-Kwan & Hughes, 1994; Dote-Kwan, Hughes, & Taylor, 1997; Ferrell, 1986). Furthermore, the scale used by Reynell was an adaptation of the Vineland Social Maturity Scale, namely, the Social Maturity Scale for Blind Preschool Children (Maxfield & Bucholz, 1957). This scale, however, was not standardized for low vision children but only for legally blind children, that is, those with visual acuities of less than 6/60 (20/200). Third, the authors had the clinical impression that the age norms of the Reynell-Zinkin scales
stated that the age as an indication of progress and specific any stage and can be late of development of a that of others in a nology. to use the Reynell-Zinkin (1979) intended, psychometric proper a first step in determ, the authors opmental age levels, they wanted to use a re advanced design of a cross-sectional design that Reynell idly. Some of the 109 were tested two to s 65 children were ing some, but not all, can lead to a severe ores (see Kirk, 1995), wanted to design an t that could indicate vel of an individual other having to admin scale first, as Reynell see also Dote-Kwan, Hughes, 1994; Dote-taylor, 1997; Ferrell, the scale used by ation of the Vineland a, namely, the Social Blind Preschool Bucholz, 1957). This not standardized for but only for legally is, those with visual 6/60 (20/200). Third, inical impression that Reynell-Zinkin scales overestimated the developmental rate of children who are visually impaired, especially in the cognitive domain. Thus, children seemed to perform less well in daily living situations than could be expected from the Reynell-Zinkin age levels.

On the basis of some data from an earlier study (see Timmer-Van de Vosse, 1992; Timmer-Van de Vosse, Hamers, & Van Mens-Weisz, 1994), the authors started a research project with two goals. The first goal was to design a concise manual for the Reynell-Zinkin scales—a manual that is now available (Vervoelod, Timmer-Van de Vosse, Van Mens-Weisz, & Hamers, 1999).

The second goal was to develop new developmental age levels for the Reynell-Zinkin scales for children with low vision and to compare these levels with the social maturity ages from the original Reynell-Zinkin scales. In this article, the authors present some psychometric properties of the Reynell-Zinkin scales and discuss some practical implications of the new age levels.

Method

Participants

To keep the reference group as homogeneous as possible, the authors studied only children with low vision and without additional impairments. Blind children and children with light perception only were not included because there are not enough children with these impairments in the early intervention program of the Bartiméus Foundation, at which the study was conducted, and sighted children were not included because they were not in the early intervention program at all.

Low vision was defined as the presence of visually directed reaching, in accordance with the definition of partial sightedness used by Reynell and Zinkin in the original manual for the scales (Reynell, 1979). The visual acuities of all the participants were below 20/60 because this is the criterion for enrollment in the early intervention program. Since data on visual acuity were not available at exactly the same ages as the data from the Reynell-Zinkin scales, it was not possible to compare the participants’ visual acuities with those in the Reynell-Zinkin data, given the maturation of the visual system and the subsequent progression in visual acuity in the first years of life. Therefore, data on visual acuity were not included in the study.

Children aged 4 and older were not included in the study because they were not in the early intervention program. Note also that in the final sample of 203 recordings in Reynell’s (1978) study, there were only 19 assessments of 4 year olds, whereas the number of administered scales for the other age groups was at least 35.

The study sample consisted of 82 low vision children without additional impairments between birth and 48 months. One of the aims of the study was to construct age scores per scale and per age group. To achieve this goal, the authors divided the children into six-month age ranges, instead of the three-month ranges in the original norm group (Reynell, 1978), so they would have large-enough samples for statistical analyses. Table 1 depicts the number of children per age group, mean chronological age at testing, and number and percentage of boys per age group.

There were 19 different ophthalmological diagnoses, the most common being albinism (n = 17), cataract (n = 10), coloboma (n = 10), aniridia (n = 7),
Table 1
Age group, chronological test age, and gender.

<table>
<thead>
<tr>
<th>Age group (in months)</th>
<th>Entire sample (n)</th>
<th>Chronological test age</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean age</td>
<td>SD</td>
</tr>
<tr>
<td>0-6</td>
<td>8</td>
<td>5.1</td>
<td>0.8</td>
</tr>
<tr>
<td>7-12</td>
<td>11</td>
<td>9.4</td>
<td>1.7</td>
</tr>
<tr>
<td>13-19</td>
<td>13</td>
<td>15.0</td>
<td>1.5</td>
</tr>
<tr>
<td>19-24</td>
<td>12</td>
<td>21.7</td>
<td>1.6</td>
</tr>
<tr>
<td>25-30</td>
<td>10</td>
<td>26.9</td>
<td>1.5</td>
</tr>
<tr>
<td>31-36</td>
<td>14</td>
<td>33.6</td>
<td>1.8</td>
</tr>
<tr>
<td>37-42</td>
<td>8</td>
<td>38.8</td>
<td>1.5</td>
</tr>
<tr>
<td>43-48</td>
<td>6</td>
<td>45.2</td>
<td>1.7</td>
</tr>
<tr>
<td>Total</td>
<td>82</td>
<td>51.2</td>
<td>1.7</td>
</tr>
</tbody>
</table>

tapetoretinal degeneration (n = 6), and nystagmus (n = 6). The ophthalmological diagnoses of three children were not known. The visual impairments of 39 children were of genetic origin, and those of 24 children were of nongenetic origin; the origins of the visual impairments of the remaining 19 children were not known.

**DESIGN**

The new developmental age levels for the Reynell-Zinkin scales were based on existing cross-sectional data. No scales were administered for research purposes only. Assessments with the Reynell-Zinkin scales were performed as part of the early intervention program. Longitudinal data were not used because there were unequal numbers of recordings of the scales per subject. Therefore, one assessment per child was included in the study.

The results were analyzed per age group. Two participants with extreme scores were excluded from the analyses for the response to sound and verbal comprehension subscale and the vocalization and expressive language structure subscale. For the social adaptation subscale and the subscale of expressive language, vocabulary, and content, one subject was excluded from the analyses because of extreme scores. For ease of comparison with the original Reynell-Zinkin data, three-month-interval data were derived by way of linear interpolation. For the calculation of the age scores, the authors used smoothed means and smoothed standard deviations. The smoothing procedure was adopted from the Reynell Developmental Language Scales (Reynell, 1969; Reynell & Huntsley, 1987). Although the manual is not explicit about this procedure (Reynell, 1979), a member of the Wolfson Centre (N. Dale, personal communication, February 18, 1999), where the Reynell-Zinkin scales were initially developed, confirmed that this procedure was also used for the original Reynell-Zinkin scales.

**PROCEDURE**

The scales were administered to each child in his or her home by one of eight early childhood specialists and psychologists with master’s degrees in special education or child development and at least two years’ experience in early intervention with visually impaired children. Not all the children were tested with all the items in a scale. On the basis of clinical experience, the person administering the scales decided where to start assessing a particular child. If the child passed the first item, all earlier

---

**Results**

Some results of this section. For reader is referred to...

**AGE LEVELS**

Figures 1 to 6 and standard...
items were scored positive, too. This procedure conforms to the instructions in the manual (Reynell, 1979).

**Results**

Some results of the study are presented in this section. For more details, the interested reader is referred to the manual (Vervloed et al., 1999).

**AGE LEVELS**

Figures 1 to 6 show the smoothed means and standard deviations for the six Reynell-Zinkin scales. As can be seen, the standard deviations vary with age—a finding that was confirmed with Levene’s test of equal variances. For use in clinical practice, the authors also constructed graphs based on percentile ranks. Exact means and standard deviations per scale, exact percentile scores per age group, and the graphs based on the means and the percentile ranks are given in the manual (Vervloed et al., 1999), available from the first author on request.

**PSYCHOMETRIC PROPERTIES**

Several psychometric properties of the Reynell-Zinkin scales could be studied with the available post hoc data: item distribution, scale reproducibility, internal consistency, standard errors of measurement, and associations with personal and environmental factors.

**Item distribution.** All items of the Reynell-Zinkin scales are scored either true or false. A test with dichotomous items differentiates best between participants when the p-values vary between .10 and .90 and the mean-value, the item difficulty, is .50 (Nunnally & Bernstein, 1994). However, the Reynell-Zinkin scales were constructed not for differentiating children or for predicting development, but for assessment purposes. Items with p-values below .10 or above .90 can still be interesting because they are valuable for planning intervention. However, items that do not vary at all (p = 0 or p = 1) are not relevant for an assessment instrument and can be disregarded. Within the age group birth to 48 months, three items showed zero variance: the first two items of the social adaptation subscale (smiling and laughing) and the first item of the sensorimotor understanding subscale (active grasp of object put into hand). These items were included in the analyses that

![Figure 1: Means for social adaptation, by age.](image)
follow so as to gain an understanding of the original Reynell-Zinkin Scales in total.

*Scale reproducibility.* If the items in a subscale form a perfect subscale, a child's performance on the discrete items can be deduced completely from the child's total scale score. In other words, whenever items are ordered hierarchically, passing a difficult item will always mean that all earlier items are passed as well (cf. Gutman, 1944, 1950). Moreover, if the Reynell-Zinkin scales are perfect, the mean chronological age belonging to a total raw score is also the mean age at which the last item is mastered. In subsequent scalogram analyses, the coefficients of reproducibility were calculated as a measure of the amount by which the scales deviate from the ideal pattern of a perfect scale. Since perfect scales were not to be expected, an acceptable approximation of a perfect scale was set at .90 reproducibility (cf. Gutman, 1950). The sensorimotor understanding subscale consists of two parts: 20 hierarchically ordered items and 3 items concerning the meaningful use of objects. Two scalogram analyses were performed for this scale, one for 20 and one for 23 items. The coefficient of reproducibility was .88 for the sensorimotor understanding subscale when the last three items were included. Placing items 21 and 22 before item 18 resulted in a coefficient of .91. The coeffic

![Figure 2. Means for sensorimotor understanding, by age.](image)

![Figure 3. Means for exploration of the environment, by age.](image)

![Figure 4. Means for re](image)

![Figure 5. Means for re](image)
mount by which the ideal pattern of a specific scale was set at .90 reproducibility was set at .90 reproducibility (Reisman, 1950). The social subscale was hierarchically ordered according the meaning-scales analyses is scale, one for 20 items. The coefficient of reproducibility for the sensorimotor understanding subscale with 20 items. Reordering the items did not result in higher coefficients of reproducibility.

Internal consistency. Internal consistency was determined by calculating Cronbach’s alpha per scale for each age group. All items were included in the statistical analyses. Leaving out the items without variation would probably lead to higher internal consistency. If a reasonable reliability level of .60 for Cronbach’s alpha is adopted, then only the sensorimotor understanding subscale showed reasonable internal consistency in the first 6 months, and the social adaptation subscale and the response to sound and verbal comprehension subscale did so in the second half of the first year. The mean for the 32 Cronbach’s alphas greater than .60 was .79 (range .63-.97). Twenty-six alphas were above .70, which is a modest reliability level according to Nunnally and Bernstein (1994). The two expressive language subscales were reliable from 19 months onward. The social adaptation scale was
internally consistent between 6 months and 3½ years. Exploration of the environment showed sufficient internal consistency between 1½ and 3½ years.

Standard error of measurement. The standard error of measurement indicates whether the raw test score of one subject is consistent and reflects the true test score. Drenth and Sijsma (1992) defined the standard error of measurement as the variation of the distribution with repeated test recordings of the same participants. The standard errors of measurement ranged between .45 and 1.77.

Associations with personal and environmental factors. Developmental age levels were calculated per age group. Since other variables than age may also be factors in the construction of developmental age levels, the authors conducted analyses to study the effect of the following variables: sex, number of persons in the family, genetic versus nongenetic origin of the visual impairment, parity, and the ophthalmological cause of the visual impairment. Fewer categories of ophthalmological causes of visual impairment were needed for statistical analysis than the 19 causes that were found, so the authors formed four ophthalmological categories that were based on an adapted version of Meire's (1998) categories by clustering the ophthalmological causes by the anatomic localization of the ocular or visual damage, irrespective of the genetic or nongenetic cause. The four categories were malformations of the eye, albinism, cerebral and optical nerve disorders, and retinal disorders. The additional effect of these variables after the effect of age group was controlled was studied in several hierarchical multivariate analyses of variance. No significant main effects for any of the aforementioned variables were found.

Comparison of Original and New Age Levels

No means and standard deviations are known for Reynell's (1978) original age scores, since Reynell gave only the range of age scores belonging to a certain raw score. Therefore, it was impossible to analyze statistically the age scores in the current study with the age scores in the original Reynell-Zinkin scales. Hence, the authors had to analyze the original and new scores by face value, comparing belonging to a charity age of 6, 12, months. The smc the new developmen tity ages were lo ages for the sat (87.5%) of the 4 means that for social maturity : new developer: the comparison: were higher, but small. In 16 (38') social maturity new norms, the standard error of age levels. Most the standard err developmental study, Overestin was found part social adaptatio understanding (: environment (4 expressive langs expressive lan content (2 times

Discussion

By studying children with lea disabilities age the authors we developmental Zinkin develop large proportion albinism, the most common cause Flemish child makes the same
formed four ophthalmological localization of the eye, irrespective of the cause. The four categories of the eye, optical nerve disorders. The additional effect of the eye, after the effect of the eye, was studied in a multivariate analysis of variance. The main effects for the variables were

AL AND NEW AGE

The authors did not attempt to normalize the scores because of the small sample size and because doing so would give the false impression that the assessment with the Reynell-Zinkin scales is detailed. The developmental age scores depicted in Figures 1 to 6 should be used with caution. Only total raw scores can be converted to developmental ages; there are no norms for discrete items.

The social developmental ages found with the original Reynell-Zinkin scales were higher than the chronological ages for the same smoothed mean in 87.5% of the cases. In 38% of the cases, in which the social maturity age was lower than the new developmental level, the difference was greater than one standard error of measurement of the new level. Thus, the clinical impression that the Reynell-Zinkin scales overestimate the development of visually impaired children was confirmed, and the need for new developmental age levels was justified.

One reason for the overestimation of children with low vision may be due to cultural differences in upbringing and education between English children with low vision in Reynell’s study and Dutch children with low vision in this study. Another
reason may be that the test results for the children with low vision at the Bartiméus Foundation were compared with the children’s chronological ages instead of their social maturity ages. The difference between these two ages can, especially for children with multiple disabilities, be very large. The relative resemblance between the original Reynell-Zinkin social maturity ages and the authors’ new developmental ages can be explained easily. Reynell and Zinkin (1975) used social maturity ages because they wanted to be able to assess the development of children with multiple disabilities, too. If they had used chronological ages, the differences between their age levels and those in the current study would have been much larger. The original Reynell-Zinkin scores indicate whether the development of a child in the six developmental domains is in agreement with the child’s social maturity. Chronological age is not a valid criterion for children with multiple disabilities because their development progresses at a different rate from their chronological ages. With children without additional impairments, social maturity will be in accordance with their chronological ages. Because the authors studied only visually impaired children without additional impairments, it is reasonable to expect that the new developmental age scores differ little from the social maturity ages of the original Reynell-Zinkin scales.

The manual of the Reynell-Zinkin scales (Reynell, 1979) gives the impression that age ranges can be applied to discrete items. This idea is tempting because it enables one to compare the results of the Reynell-Zinkin scales with other test results (see, for example, Ferrell, 1986). The scalogram analyses showed that the scales are nearly perfect hierarchically ordered scales. However, it is still preliminary to use the corresponding developmental age for the scale score as the age equivalent for the last item passed by a child in this scale (cf. Ferrell, 1986). Future longitudinal research should determine the mean age at which a discrete item is mastered.

Not all the Reynell-Zinkin subscales can be used at all the eight age intervals between birth and 48 months because the internal consistency of the subscales is not sufficient at all ages. In the first six months, only the sensorimotor understanding subscale is internally consistent, and in the second half of the first year, the social adaptation subscale and the response to sound and verbal comprehension subscale are internally consistent. The expressive language subscales should be applied after age 18 months. The subscale exploration of the environment shows sufficient internal consistency between 18 and 30 months of age, and the social adaptation subscale does so between 6 and 42 months. Only the sensorimotor understanding subscale seems to be reliable for the entire age range of birth to 48 months, with the exception of the second half of the first year. Except for a small number of participants, the authors have no reasonable explanation for the lack of internal consistency for this age interval.

Apparently, Reynell and Zinkin did not succeed in constructing scales with items that are suited for the whole age range for which the Reynell-Zinkin scales were intended. This failure is easily understood for the expressive language scales, which start with verbalization items and exclude preverbal behaviors, such as listening to sound and reaching for a sound source, that can be seen in infants younger than 18 months. Consequently consistent. The scale explor should be used y suitable only for months. There se because after 30 t progression in th also Vervloed et concluded that g the best time to Zinkin scales is b years.

The introduction for the age score Zinkin scales to the psychometric properties are known available, the us for the Reynell-Z scales. First, R the age levels w of the rate of a child. The result: variation and into the scales can be pose to children age scores were tion of specific stage. Although able, the authors the scales for t valid comparison also necessary to which are not a scores to perc. 1995) to have ferent scales is centile ranks ar the raw scores a paring different
ordered scales, imaginary to use the mental age for the equivalent for the last in this scale (cf. longitudinal research). The age at which a

Zinkin subscales can be used for children aged 18 months. Consequently, this scale is internally consistent from six months onward. The scale exploration of the environment should be used with caution because it is suitable only for children aged 18 to 30 months. There seems to be a ceiling effect because after 30 months, there is hardly any progression in the scores for this scale (see also Vervloed et al., 1999). Thus, it can be concluded that given internal consistency, the best time to administer the Reynell-Zinkin scales is between ages 1 year and 3½ years.

The introduction to this article stated that for the age scores of the original Reynell-Zinkin scales to be reliable and valid, some psychometric properties of the scales should be known. Now that some of these properties are known and new age levels are available, the usefulness of the age levels for the Reynell-Zinkin scales can be reconsidered. First, Reynell (1979) thought that the age levels were useful as an indication of the rate of progress of an individual child. The results from the analyses of item variation and internal consistency show that the scales can be administered for this purpose to children aged 1 to 3½. Second, the age scores were thought to give an indication of specific areas of difficulty at any stage. Although new age levels are available, the authors do not recommend using the scales for this purpose because for a valid comparison of the separate scales, it is also necessary to have standardized scores, which are not available. Recoding the raw scores to percentages (see Dote-Kwan, 1995) to have comparable scores of different scales is inappropriate, since percentile ranks are linear transformations of the raw scores and are not suitable for comparing different scale scores.

Third, the age scores were also given to compare the rate of development of a particular child with that of others in a comparable visual category. The new age levels and the availability of the standard errors of measurement make it possible to make this comparison. The authors recommend checking whether a child’s observed score falls within or outside the 95% reliability interval before deciding whether a child shows advanced or delayed development compared with his or her visually impaired peers. This reliability interval can be calculated by multiplying the standard error of measurement with a z-score of 1.96, which corresponds to the 95% significance level in the normal distribution, and adding to and subtracting this value from the mean scale score for this child’s age. If used in the ways described here, the Reynell-Zinkin scales can be valuable assessment scales and, as such, are a useful part of early intervention programs for children with visual impairments.

References


Mathijs P. J. Vervloed, Ph.D., assistant professor, Department of Special Education, University of Nijmegen, P.O. Box 9104, 6500 HE, The Netherlands; E-mail: <m.vervloed@ped.kun.nl>. Jo H. M. Hamers, Ph.D., associate professor, Department of Educational Sciences, University of Utrecht, The Netherlands. Marion M. van Mens-Weisz, M.A., developmental psychologist, Bartiméus Foundation, Zeist, The Netherlands. Hanneke Timmer-Van de Vosse, M.A., educational psychologist, University of Utrecht, The Netherlands. Address all correspondence to Dr. Vervloed. For information on the Dutch manual for the Revised Reynell-Zinkin scales, write to the Bartiméus Foundation, Research & Development, P.O. Box 1003, 3700 BA Zeist, The Netherlands.

---

**The Finnish Impairment with friends**

**Taina Huur**

Abstract: This was compared with no especially the friends than well-being those with chronic illness an increased risk of social problems need for medical services, and a well as other which can cause. Boyle, Szatmári, Gortmaker, W. 1990; Lavigne Patterson & B Gough, Lashley, Resnick, H Hai Adolescents who are blind o reported to have relationships, s lated, having

---

The study reported is grant from the Yrji Accepted October

---