# The DTVP-2 visual closure subtest: a closer look

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**ABSTRACT**

*The Developmental Test of Visual Perception, 2nd edition (DTVP-2), is a valuable measuring tool to assess children's visual perceptual abilities. Although this test is standardised for the American population, it is often used by South African occupational therapists. The DTVP-2 consists of eight sub-tests, of which one is the visual closure sub-test. Clinical experience and research have shown that children often score below average on the visual closure sub-test, despite scoring average or above average on the other sub-tests. A quantitative, descriptive study investigated the validity of the DTVP-2's visual closure subtest. Forty children, five years of age, regardless of race, who could understand and speak English, participated in the study conducted in Bloemfontein, South Africa. Each child completed the DTVP-2 according to the prescribed procedures. Forty per cent of the children scored below average in the visual closure sub-test, which was statistically significantly lower than the other sub-tests. Therapists using this test should interpret the results of the visual closure sub-test with care, and consider its influence on the General Visual Perception Quotient. This study emphasises the need for a visual perceptual test standardised for the South African population.*

**Key words**: Developmental Test of Visual Perception; DTVP-2; validity; visual closure; visual perception



## Introduction

Occupational therapists in South Africa use several visual perceptual tests that are not standardised for the South African population. One such test is the Developmental Test for Visual Perception, 2nd edition (DTVP-2)[1]. It may be argued that the DTVP-2 is a valuable measuring tool used to assess children's visual perceptual abilities, although the validity of the test for the South African population has not yet been established. Previous research[2–4] found that children often score below average on the visual closure sub-test when using the DVTP-2, despite obtaining average scores on the other seven sub-tests.

The DTVP-2 assesses visual perceptual abilities and consists of the following eight sub-tests: (i) eye-hand coordination; (ii) position in space; (iii) copying; (iv) figure-ground; (v) spatial relations; (vi) visual closure; (vii) visual-motor speed; and (viii) form constancy.

The DTVP-2 is used to document the presence and degree of visual perceptual or visual-motor difficulties in individual children, and also to identify candidates for referral, verify the effectiveness of these intervention programs and serve as a research tool[1]. Even though it is not standardised for the South African population, the DTVP-2 remains a valuable tool for occupational therapists to measure a child's visual perceptual skills and an effective tool to assist in the diagnosis of children with visual perceptual problems.

Groffman[5] describes visual perception as a method in which the nervous system, through the use of the eyes, makes contact with the outside world. Zaba[6] defines visual perception as the process of integration responsible for the reception and cognition of visual stimuli. In addition, Schneck[7] asserts that visual perception is an important factor in the competent performance of many constructional play activities and fine motor tasks, and children who struggle with visual perception may have difficulties in self-care, academic performance, play and leisure.

Visual closure, one of the visual perceptual abilities, is the identification of forms or objects from incomplete presentations, which enables a person to quickly recognise objects, shapes and forms, either mentally completing the image or by matching it to information previously stored in memory[6]. Visual closure allows one to make assumptions regarding what the object is without having to see the complete presentation, for example when reading or writing. The objective of the visual closure sub-test in the DTVP-2 is to measure the ability to recognise a stimulus figure when it has been incompletely drawn[1].

Research done by Visser[2] which involved a population similar to the investigation reported here, revealed that 50% of children aged 5 and 6 years who were assessed with the DTVP-2, scored below average in the visual closure sub-test. Van Rhomburg[3] found that 97.5% of Grade 1 children scored below average on the visual closure sub-test and found visual closure to be their greatest visual perceptual problem. Richmond and Holland[4] found that Grade 1 to 4 learners obtained DTVP-2 visual closure scores that were significantly lower than those obtained in the Test of Visual Perceptual Skills Revised.

In addition to the research referred to, therapists who use the DTVP-2 on a regular basis, have documented that children tend to score lower on the visual closure sub-test in comparison to the other seven subtests. This led the researcher to question the reliability and validity of the visual closure sub-test

Validity refers to the degree to which a test measures the attributes that its author says that it measures[1]. The DTVP-2 was found to be valid for the American population for which it has been developed but as seen in the research above, South African children score differently to the American population. Similarly, Cheung et al.[8] found in their study of the DTVP-2 with Hong Kong children, that this assessment battery displayed discrepancies in comparison to the American population. As already mentioned, South African

research also showed that children score lower on the visual closure sub-test compared to the other subtests of the DTVP-2 and TVPS-R test[2–4]. This led to question whether this finding could be attributed to the test being not standardised for the South African population (criterion validity), or is it because the visual closure sub-test does not have content validity?

Reliability refers to the consistency with which an instrument measures ability[9]. Criterion-related validity, according to Hammill et al.,[1] is used to either compare a test with a valued measure having similar characteristics (concurrent validity) or to predict the future performance of a student (predictive validity)[1]. Hammil et al[1:40] further states that "although the predictive validity of the DTVP-2 has yet to be explored, the test has been examined with respect to concurrent validity". (More information regarding validity studies can be found in Hammil[1:40]). Richardson[10] stated that criterion-related validity refers to the ability of a test to predict how an individual performs on other measurements or activities. In order to establish criterion-related validity, the test scores were checked against a criterion, an independent measure of what the test is designed to predict. The DTVP-2 and the criterion measures ie the Motor-Free Visual Perception Test (MVPT)[11] and the Developmental Test of Visual Motor Integration (VMI)[12], were highly correlated and provided strong evidence of criterion-related validity (for the American population)[1]. South Africa occupational therapists use the DTVP-2 knowing that it has been standardised for the American population, as they have found that SA children obtained scores similar to the American population, with the exception of the visual closure sub-test. Hammill et al., however expressed the hope that "future research will study the validity of the DTVP-2 with other samples of children in different settings"[1:40].

These observations noted above led to questioning the criteria- and content-related validity of the visual closure subtest and its items. The aim of the study was therefore to investigate whether the DTVP-2 is a valid measuring tool for the assessment of visual closure ability in English-speaking South African children at five years of age. In order to determine this, the following questions were asked: (i) how do South African English-speaking children aged five score in the DTVP-2's visual closure sub-test; (ii) compared to the other sub-tests, do children obtain scores that are significantly different to the visual closure sub-test; and (iii) is there a difference between the prescribed method (with application of the ceiling rule) and the adapted method (without application of the ceiling rule) with regard to the visual closure sub-test?



## Methodology

The study design was a quantitative, descriptive research study, aimed to investigate the validity of the DTVP-2's visual closure subtest. Approval to perform this investigation was obtained from the Ethics Committee of the Faculty of Health Sciences at the University of the Free State in Bloemfontein.

As the DTVP-2 has been standardised in English for American children and is not available in any other language, the researchers tested children of any race who could speak and understand English, to obtain a population resembling the American population as closely as possible.

The researchers decided to use one age group for the study in order to rule out the influence of age on the research as the norm raw scores given for the visual closure sub-test, increase significantly more between four and six years of age than between other ages[1]. It was therefore decided to assess five-year-old children.

For this study, four English-speaking pre-primary schools in Bloemfontein were identified and selected by means of convenience sampling to participate in the research. Convenience sampling was based on limited time, the distance of pre-primary schools with English-speaking children from the University of the Free State, and travel costs. Information letters and consent forms were distributed to the principals of these schools. After permission was received from the principals of the schools, the researchers visited the schools to identify an appropriate room for test administration and to determine the number of English-speaking five-year-old children available for the study. The total number of five-year-old children attending these schools were provided by the principals, with 30 children in School A, 40 in School B, 30 in School C and 59 in School D, giving a total of 159 children available for the study prior to applying exclusion criteria.

In addition to parental/guardian consent to being included in the study, the following exclusion criteria were used to ensure that children were able to participate effectively in the testing of the DTVP-2:

(i) not being able to speak or understand English;
(ii) not having attended a pre-primary school for at least one year;
(iii) having received occupational therapy interventions previously for matters such as sensory integration, perceptual and fine-motor problems;
(iv) having been tested with the DTVP-2 in the six-month period preceding the research;
(v) having been identified with physical or cognitive disabilities as a result of pathologies, such as autism, attention deficit disorder, developmental delays, or learning disabilities, that could negatively influence their participation in the test;
(vi) having parents or teachers who were concerned about their classroom performance and/or suspected fine motor, perceptual or emotional problems or intellectual impairments that could influence participation during the test; and
(vii) once having been assessed and scored by the researchers, had a General Visual Perception composite quotient score below 90.

An information letter, accompanied by a consent form and a checklist for the exclusion criteria, was sent to the parents of the 159 children from the different schools. One week after the forms were sent out, the researchers revisited the schools to collect completed consent forms. The researchers made use of posters at the schools involved, liaised with teachers and re-sent information letters and consent forms in order to achieve a response rate of 65 (out of 159). These forms were checked to determine which children should be excluded**.** In total, 40 children could be included in the study. The research was performed in the period 4–12 May 2010.

A pilot study was done with 8 children (2 from each school as listed in *Table 1*.) in order to determine possible errors in the data collection, children's assent forms, administering and scoring of the DTVP-2 and data forms. The pilot study also provided the researchers with a clearer estimation of how much time was required to both test and score a child's DTVP-2, and to eliminate any problems that could occur during the testing and scoring of the DTVP-2. These children's findings were included in the study, since only minor format changes were made to the data collection form.

Participation in the research was voluntarily and participants could withdraw from the study at any time. Results remained confidential as a number was allocated to each participant and names were not used on the data collection sheet. Parents were able to receive their children's results of the DTVP-2 on request, and if necessary, were referred to a qualified occupational therapist in their area. All eight sub-tests were administered even though the study focussed on visual closure, firstly, to adhere to standard procedures; secondly, all eight sub-tests' results were used in order to compare the visual closure sub-test results with the other seven sub-tests; thirdly, the General Visual Perception (GVP) quotient (the composite score from all eight subtests), was used to determine whether children were excluded from the study (see exclusion criteria (vii)). The researchers received training in the proper use of the DTVP-2 and followed the standardised method of test procedures as stipulated by the DTVP-2 manual[1], which provided a uniform method of testing and observation during the administration of the test.

The DTVP-2 subtests are divided into two components[1] namely (i) visual motor integration (VMI); and (ii) motor reduced visual perception (MRP), which includes the visual closure sub-test. The DTVP-2 uses the stop-rule where a 'ceiling' is applied. Once a

ceiling is reached, testing for that sub-test is discontinued. However, in the VMI sub-tests (eye-hand coordination, copying, spatial relations and visual motor speed) the ceiling does not apply (except for copying) and participants are scored according to the number of items correct. In the MRP sub-tests (position in space, figure-ground, visual closure and form constancy) the ceiling is applied when three mistakes are made within a bracket of five items.

The visual closure sub-test comprises 20 items. In each item, a complete image is given which must be matched to one of the three incomplete images. For the purpose of this study, the visual closure sub-test was scored twice. Firstly, the visual closure score was obtained by scoring in the prescribed way, in which the test is stopped after the ceiling has been reached. Secondly, the score was obtained by allowing the child to complete all twenty items irrespective of incorrect answers (the adapted scoring method). The prescribed and adapted visual closure scores, together with the other seven sub-tests, were converted to a prescribed and adapted General Visual Perception score. A comparison of the prescribed and adapted scoring method gave an indication of the content, level of difficulty and/or the sequence of items in the visual closure sub-tests.

Children were tested at their schools. In each case, the researcher collected the child individually from the classroom, and took the child to the area allocated by the school prior to the administering of the test. The area consisted of a suitable table, two chairs, sufficient lighting and minimal external distractions. The testing procedure was explained to the child, before he/she was required to give assent. A sharp pencil and response booklet was provided to the child.

After the tests were administered and scored, the scores were transferred to the data collection sheet. Statistical analysis of data was done by the Department of Biostatistics, University of the Free State. Descriptive statistics, namely frequencies and percentages for categorical data, and medians and percentiles for continuous data, were calculated per calculation method. The difference between the methods was calculated and described by means of 95% confidence intervals.

*Table I: Outcome of consent forms sent to parents and returned, and children excluded or included in the study*

| School | Consent forms | | Children with consent | | Percentage participation |
|---|---|---|---|---|---|
| | Sent out | Returned | Excluded | Included | |
| School A | 30 | 18 | 7 | 11 | 27.5 |
| School B | 40 | 11 | 4 | 7 | 17.5 |
| School C | 30 | 11 | 6 | 5 | 12.5 |
| School D | 59 | 25 | 8 | 17 | 42.5 |
| **Total** | **159** | **65** | **25** | **40** | |

*Table II: Results of the DTVP-2 subtests*

| DTVP-2 subtest | Number and percentage of children (n=40) scoring: | | | | | |
|---|---|---|---|---|---|---|
| | Below average (< 8) | | Average (8–12) | | Above average (> 12) | |
| | n | % | n | % | n | % |
| Eye-hand coordination | 1 | 2.5 | 33 | 82.5 | 6 | 15.0 |
| Position in space | 7 | 17.5 | 30 | 75.0 | 3 | 7.5 |
| Copying | 1 | 2.5 | 20 | 50.0 | 19 | 47.5 |
| Figure-ground | 1 | 2.5 | 24 | 60.0 | 15 | 37.5 |
| Spatial relations | 0 | 0 | 20 | 50.0 | 20 | 50.0 |
| Visual closure | 16 | 40.0 | 23 | 57.5 | 1 | 2.5 |
| Visual motor speed | 5 | 12.5 | 24 | 60.0 | 11 | 27.5 |
| Form constancy | 0 | 0 | 26 | 65.0 | 14 | 35.0 |

*Table III: 95% Confidence interval for the percentage difference for paired data: a comparison of the percentage of participants with below average scores on the visual closure subtest and the other seven DTVP-2 subtests*

| Comparison of visual closure (VC) below average scores to the other seven DTVP-2 subtests | 95% CI |
|---|---|
| VC versus eye-hand coordination (40% vs. 2.5%) | [19.3% ; 53.3%] |
| VC versus position in space (40% vs. 17.5%) | [5.0% ; 38.4%] |
| VC versus copying (40% vs. 2.5%) | [20.6% ; 53.0%] |
| VC versus figure-ground (40% vs. 2.5%) | [19.3% ; 53.3%] |
| VC versus spatial relations (40% vs. 0%) | [23.8% ; 55.4%] |
| VC versus visual motor speed (40% vs. 12.5%) | [8.2% ; 44.4%] |
| VC versus form constancy (40% vs. 0%) | [23.8% ; 55.4%] |

## Results and Discussion

*Table I* shows that, from the four schools, a total of 159 information letters and consent forms were sent out to parents of possible research candidates, and 65 consent forms were returned, giving a response rate of 40.9%. Twenty-five children obtained parental consent, but were not eligible to participate in the study and were excluded due to (i) age, being younger or older than five years (10); (ii) emotional problems according to their parents that could influence their participation in the DTVP-2 (4); not having attended a pre-primary school for at least one year (4); having seen an occupational therapist in the preceding year (4). The remainder were then tested on the DTVP-2 and the results of a further three children were excluded as they obtained a score of less than 90 for General Visual Perception (see *Table I*).

After considering the exclusion criteria, 40 children qualified to participate in the research, of which 24 (60%) were female. The median age of the participants was five years and seven months, with the youngest participant being 5.1 years of age and the eldest 5.9 years. Although not a determining factor for this study, children of various races, such as African, Caucasian, Coloured, Indian and Asian participated.

*Table II* shows that 40% of participants scored below average (a standard score below 8) on the visual closure sub-test. This finding confirms results reported by Visser[2] and Von Romberg[3], who also found that children score lower on the visual closure sub-test than any other sub-test. More than half of the participants (57.5%) had an average score on the visual closure sub-test (a standard score of 8–12), while only 2.5% scored above average (a standard score above 12). In no other subtest did such a large percentage of children score below average.

Results indicated that either no children or only 2.5% of them, scored below average in eye-hand coordination, copying, figure-ground, spatial relations and form constancy. With the exception of eye-hand coordination, a substantial percentage of children (35% up to 50%) scored above average on these sub-tests. This observation could be an indication that children are exposed to similar activities at school for example dot-to-dot, copying pictures and shape recognition activities. This observation could also be due to the test items being too easy.

*Table III* shows the 95% confidence intervals (CI) for the differences between paired data when comparing the visual closure below average score with those of the other seven DTVP-2 subtests. All these differences were found to be statistically significant.

Similar findings by Richmond and Holland[4] suggested that when comparing the results of the visual closure sub-tests of the DTVP-2 with the TVPS, the DTVP-2's visual closure sub-test scores were significantly lower.

In *Table IV*, it can be seen that 40% of participants scored below average in the visual closure sub-test with the prescribed scoring

*Table IV: Results of the adapted and prescribed method of scoring of the visual closure subtest*

| Visual closure | Number and percentage of children (n=40) scoring: | | | | | |
|---|---|---|---|---|---|---|
| | Below average (< 8) | | Average (8–12) | | Above average (> 12) | |
| | n | % | n | % | n | % |
| Prescribed scoring | 16 | 40.0 | 23 | 57.5 | 1 | 2.5 |
| Adapted scoring | 2 | 5.0 | 18 | 45.0 | 20 | 50.0 |

*Table V: Comparison of visual closure standard scores and GVP median scores*

| | Scoring method | | | | | | |
|---|---|---|---|---|---|---|---|
| | Prescribed | | | Adapted | | | 95%CI[c] |
| | Min[a] | Median | Max[b] | Min[a] | Median | Max[b] | |
| Standard score: visual closure | 5 | 8 | 14 | 7 | 11.5 | 17 | [3 ; 4] |
| General vision perception (GVP) | 70 | 87.5 | 117 | 72 | 90 | 127 | [3 ; 4] |

[a]Min = minimum score; [b]Max = maximum score; [c]95% CI for the difference between medians

*Table VI: Raw score for each method*

| | Score | | | Comparing | 95% CI[c] |
|---|---|---|---|---|---|
| | Min[a] | Median | Max[b] | | |
| Prescribed method | 1 | 4.5 | 12 | Prescribed – Adapted | [-5 ; -3]* |
| % Correct sequence | 4 | 9.5 | 15 | % Correct – Adapted | [-4 ; -1]* |
| Adapted method | 2 | 5 | 15 | Prescribed – % Correct | [-2 ; 1] |

[a]Min = minimum score; [b]Max = maximum score; [c]95% CI for median difference; *statistically significant

method, compared to only 5% scoring below average using the adapted scoring method. This illustrates the significant influence that the ceiling (stop-rule) has on the visual closure results (95% CI for percentage difference [18.7% ; 50.2%]). In comparison to other sub-test results showing the percentages of children who obtained below average scores (*Table III*), the adapted method might be a more accurate way of scoring the visual closure sub-test.

When comparing the standard scores of the visual closure sub-test and the GVP using the prescribed and adapted scoring methods, the adapted scoring was significantly higher (see *Table V*).

The raw scores for each of the methods are shown in *Table VI*.

The composite quotients (GVP scores) are the most reliable DTVP-2 scores[1]. Sub-test scores should not be looked at individually only. As asserted by Hammill et al., "interpretations, diagnoses and judgements made on the basis of subtests scores are going to contain considerably more error than those based on composite (GVP) scores"[1:25]. Thus interpretation of results is important when making decisions regarding diagnoses and in treatment planning. If misinterpreted, sub-tests in which children scored below average could become areas of focus in treatment. As shown in *Table V*, inaccurate scores on a particular sub-test could have a direct effect on the GVP scores, and could cause the GVP scores to be below average which could indicate an unnecessary need for treatment. This is confirmed by Richmond and Holland[4] who suggest that the significantly lower visual closure scores in the DTVP-2 could result in the possibility of over-identification of visual closure difficulties.

Cheung et al.[8] revised and adapted each subtest of the DTVP-2, based on the Hong Kong population. Twelve experienced occupational therapists were asked to rate the level of difficulty, relevance and representation of the items in each of the sub-tests. This resulted in the conclusion that all items were relevant in testing children's visual perceptual abilities[8] and no adaptations were made to the visual closure sub-test. This contradicts our findings as seen in *Figure 1*, in which all 20 items of the visual closure sub-test were individually analysed. *Figure 1* shows the percentage of participants who provided correct responses to each of these items. From these findings it was evident that the participants' results in the test items did not progressively decrease as one should expect of items that get progressively more difficult. This observation could be an indication that either the content, level of difficulty or the sequence of the test items might be incorrect. It correlates with findings by Richmond and Holland[4] who suggested that the DTVP-2 tends to display difficulties, which may possibly relate to the lack of linearity in the visual closure sub-test items.

Only one child was able to progress up to item 15 on the visual closure sub-test using the prescribed method of testing. A small number of children could not answer items 3, 4 and 5 correctly. The three items in a row caused a ceiling effect when scored in the prescribed way. Other items such as 6, 12 and 19 could have been placed earlier in the subtest to give the younger children a better chance to achieve average scores, as displayed in the adapted scoring method and % correct method (*Table V*). This may lead to questioning the level of difficulty of items as well as the sequencing of the items of the visual closure sub-test.

*Figure 2* shows the results of the DTVP-2 visual closure sub-test item scores from the highest ('easiest') to the lowest ('most difficult'). The purpose of *Figure 2* is to recommend an adapted sequence of presenting the visual closure subtest items, in order to expose participants to items of increasing difficulty.

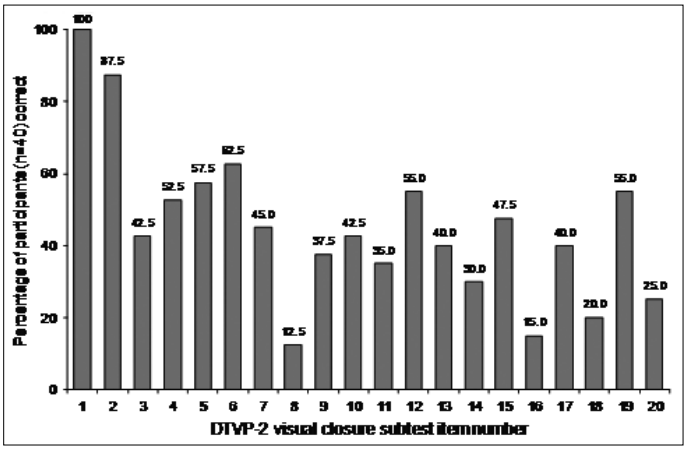


*Figure 1: Percentage of participants with correct responses to items of the visual closure sub-test*

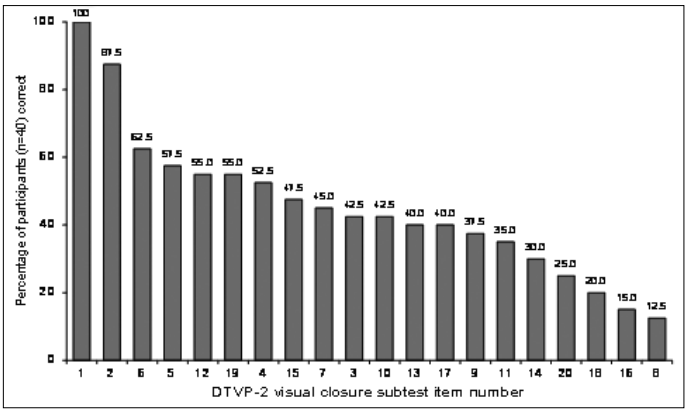


*Figure 2: The proposed sequence of items in the visual closure sub-test if presented from the easiest to the most difficultt*

## Conclusion, Limitations and Recommendations

The results of the study suggest that that the DTVP-2 is not a valid measuring tool to assess the visual closure abilities of English-speak-

ing five-year-old South African children as seen in Bloemfontein.

The results further indicate that the visual closure sub-test yields statistically significant more below average scores than the other sub-tests. On analysis of the percentage of participants' correct scores for each item of the visual closure sub-test, it was noted that the content, difficulty level and/or the sequence of the test items could be incorrect. Further research in item analysis of the DTVP-2's visual closure sub-test is recommended.

The authors acknowledge the fact that the study had the following limitations that should be taken into account:

- The study population only consisted of children who could understand and speak English.
- This was an undergraduate research study thus limiting the time, available finances and scope of the study. The sample was therefore limited to 40 children, aged 5 years in a limited geographical area of schools in Bloemfontein.

It would be of value to research the validity of the DTVP-2 with other, larger samples of children in different settings[1] as well as the influence of culture and gender on the results of the test. Questions that have been highlighted through the study are as follows: Are the results found in this study purely related to age 5 or will future research with other age groups show similar skewed results? Is Visual Closure perhaps not that developed in the 5 year old age group, as it requires more abstract thought? How do the visual closure results from the DTVP-2 compare with other visual closure measurement tools?

It is recommended that occupational therapists in South Africa receive information on the findings of this research in order to interpret DTVP-2 results with care for the South African population, as further investigations are needed to standardise this instrument for local circumstances.

## References


1. Hammill D, Pearson NA, Voress JK. Developmental Test of Visual Perception. 2nd Edition. Texas: Pro-Ed, 1993.
2. Visser MM. The association of an omitted crawling milestone on pencil grasp and control in a 5 & 6 year old population. Unpublished MSc Occupational Therapy dissertation. Johannesburg: University of the Witwatersrand, 2004.
3. Van Rhomburgh JA. Die voorkoms van visuele-persepsieprobleme en die effektiwiteit van Arbeidsterapie groepbehandeling onder Gr. 1 Kleurling leerders. [The prevalence of visual perception problems and the effectivity of Occupational Therapy group treatment among Gr. 1 Coloured learners]. Unpublished M Occupational Therapy dissertation. Bloemfontein: University of the Free State, 2006.
4. Richmond J, Holland K. Correlating the Developmental Test of Visual Perception-2 (DTVP-2) and the Test of Visual Perceptual Skills Revised (TVPS-R) as assessment tools for learners with learning difficulties. South African Journal of Occupational Therapy, 2011; 41: 33–37.
5. Groffman S. Visual Closure. New Jersey: US Department of Health, Education and Welfare, 1970.
6. Zaba JN. Visual perception versus visual function: invited reactions from optometrists. Journal of Learning Disabilities, 1984; 17; 182–185.
7. Schneck, CM. Visual perception. In J Case-Smith (Ed.), Occupational Therapy for Children. 5th edition. St. Louis: Mosby, 2001.
8. Cheung P, Poon M, Leung M, Wong R. The Developmental Test of Visual Perception-2 Normative Study on the Visual-Perceptual Function for children in Hong Kong. Physical & Occupational Therapy in Pediatrics, 2005; 25: 29–43.
9. Leedy PD. Practical Research: Planning and Design. 8th edition. Upper Saddle River: Merrill Prentice Hall, 2005.
10. Richardson PK. Use of standardized tests in pediatric practice. In J Case-Smith (Ed.), Occupational Therapy for Children. 5th edition. St. Louis: Mosby, 2001.
11. Colarusso R. and Hammill DD. Motor-Free Visual Perception Test. Navato: Academic Therapy Publications, 1972.
12. Beery KE. The Developmental test of Visual Motor Integration, 3rd Edition. Cleveland: modern Curriculum Press 1989.


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# Book review

## Title: Brain development - Milestones and learning

**Author:**
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**Book information:**

| | |
|---|---|
| Publisher: | Mind Moves Institute |
| Publication date: | 2011 |
| ISBN number: | 978-0 -620-50338-9 |
| Paperback: | 233 pages |
| Price: | R240 (including postage) |

This book is aimed at new parents or caregivers and it provides general information on various subjects such as pregnancy, birth and childhood development and milestones. It is written in an easy-to-understand-language and there are interesting snippets of information throughout the book. These relate to specific questions parents might have, relevant facts, research, advice for parents or explanations of specific medical terminology. The focus of the book is on the 'reflex brain', the 'thinking brain' and the 'feeling brain' and on how stimulation helps with the 'wiring' of the baby's brain as well as the role parents can play in this process. The book is divided into 3 parts: part one focuses on the development of the baby's brain, part two on the development of the central nervous system and the body map and part three focuses on motor milestones.

**Brief summary of the content of each chapter:**

Part one (Chapter 1- 6): The first six chapters focus on how babies learn and develop and what parents can do to promote this learning and development, even in the womb. It acknowledges that parenting is hard but assures parents that they are able to provide what the baby needs. These chapters provide basic information on health, nutrition, fitness, the management of stress as well as the effect of environmental pollutants and lifestyle factors while being pregnant. It also refers to the 'unseen parent' i.e. the baby's reflex system which is described in some detail throughout the book. There is a strong emphasis on the importance of reflexes and how these can affect a child's development if the reflexes do not become integrated. The impact of birth on the baby as well as the development inside and outside the womb is briefly discussed.

Part two (Chapter 7 - 11): These chapters highlight the development of each individual sense: touch, vestibular sense, proprioception, smell, taste, hearing and sight. Basic guidelines and activities are provided on how to stimulate the baby's senses. Reference is then also made to specific 'SOS signals' in babies as well as 'SOS signals' in children older than 3 years of age indicating when the various senses are not developing properly. Both 'BabyGym Moves' (movements that are done by the parent) and the 'Mind Moves' exercises (movements that are done by the child him/herself) are included to equip the parent with some practical ideas on how