Paediatric occupational therapists often assess and treat school-age children and youth presenting with visual perceptual dysfunction. It is, therefore, important that occupational therapists use visual perceptual instruments that possess sound measurement properties (such as validity, reliability, responsiveness and clinical utility). The *Motor-Free Visual Perception Test – Revised* (MVPT-R) is an instrument frequently used by paediatric occupational therapists. Clinicians need to be cognisant of the measurement properties of the assessments they use in order to provide the best level of care for the paediatric clients they serve. Therefore, a review and critique of the MVPT-R is presented.

Even though the MVPT-R has been revised recently, little has been done to address issues related to its reliability and validity. Evidence of criterion-related validity and construct validity, in particular, is still lacking. The rationale for measuring motor-free visual perception is also not well developed and needs to be expanded in the MVPT-R manual. In addition, the issue of summing the scores from the five MVPT-R subscales is questionable. What the final MVPT-R summed score really measures in terms of a screening evaluation or diagnosis is also lacking. At this stage, this instrument should be used and interpreted by occupational therapists with caution.

Motor-Free Visual Perception Test – Revised: an Overview and Critique

G Ted Brown, Sylvia Rodger and Aileen Davis

Introduction

Paediatric occupational therapists often assess and treat visual perceptual problems in children and youth (Wallen and Walker 1995, Chu and Chia 1997, Gentile 1997, Schneck 2001). Visual perceptual dysfunction can have a negative impact on a number of occupational performance and functional skill areas for school-age children and youth (Bouska et al 1990, Reid and Drake 1990, Schneck and Lemer 1993, Weil and Amundson 1994, Erhardt and Duckman 1997). In the 1970s, several visual perceptual tests were developed including the *Motor-Free Visual Perception Test* (MVPT) (Colarusso and Hammill 1972), which is one of the tests most frequently used by paediatric occupational therapists (Rodger 1994, Feder et al 2000, Bishop and Curtin 2001, Miller et al 2001, Burtner et al 2002a). This instrument was revised in 1996 and is now known as the *Motor-Free Visual Perception Test – Revised* (MVPT-R) (Colarusso and Hammill 1996).

It is important for occupational therapists to be aware of how the instruments and scales they use in their clinical practice were developed, the reliability scores obtained in the standardisation process, the validation procedures used to create them and any inherent weaknesses and limitations that the tests might possess. This paper provides a critical review of the MVPT-R and its development, standardisation, reliability and validity. This, in turn, will allow occupational therapists to choose the most rigorously developed assessment tools, diagnose visual perceptual dysfunction appropriately and measure effectively any change in a client's occupational performance, impacted by visual perceptual dysfunction, as a result of therapeutic intervention.

Motor-Free Visual Perception Test – Revised: an overview

The MVPT-R purports to be a short and valid measure of global visual perception (Colarusso and Hammill 1996). Visual perception is defined as the ability to identify, organise, interpret and comprehend visual information received by a person through his or her eyes (Hammill et al 1993). Colarusso and Hammill (1972) developed the original version known as the MVPT based on the work of Chalfant and Scheffelin (1969). It was designed to provide a general measure of visual perceptual processing ability that was uncontaminated by motor performance. The MVPT assessed five subskills of visual perception: spatial relationships, discrimination, figure-ground, closure and memory. The definitions of the five visual perceptual subskills are given in Table 1. When the MVPT was revised in 1996 (MVPT-R) from the original 1972 edition, the upper age-range of norms was increased to include children up to 12 years of age. Four additional items were also added to the revised version to accommodate the increased age-range covered by the norms of the instrument (Colarusso and Hammill 1996). However, Burtner et al (2002b, p26) asked

Table 1. Definitions of the *Motor-Free Visual Perception Test – Revised* subskills assessed

Visual discrimination	The ability to discriminate dominant features in different objects; for example, the ability to discriminate position, shapes, forms, colours and letter-like positions
Visual figure ground	The ability to distinguish an object from its background
Visual memory	The ability to recall dominant features of one stimulus item or to remember the sequence of several items
Visual closure	The ability to identify incomplete figures when only fragments are presented
Visual spatial relationships	The ability to orient one's body in space and to perceive the positions of objects in relation to oneself and to objects

Source: Colarusso RP, Hammill DD (1996) *Motor-Free Visual Perception Test – Revised.* Novato, CA: Academic Therapy Publications.

that it be noted that 'this data was added to the 1972 data with no re-standardisation of the test for all age-groups and no adult data was collected'.

The MVPT-R is a 40-item, individually administered, multiple-choice scale using a flip-chart format. Designed for children of 4-12 years of age, it evaluates visual perceptual skills without a motor response (Asher 1996). Similar to the original version, the MVPT-R consists of five sections: visual discrimination, visual figure ground, visual memory, visual closure and visual spatial relationships (Colarusso and Hammill 1996). The items, each presented on a separate page, are generally black and white geometric shapes, although there are a few alpha-numeric figures. The plates consist of a target stimulus with horizontally placed response choices. Subjects may respond by pointing or may use another gestural system.

The MVPT-R is administered individually, generally in less than 10 minutes. The directions are clear and the materials are easy to administer. Because the format is rather inflexible, it is unlikely that an examiner would choose to administer the five sections in an order different from the one prescribed in the test manual. Scale items are scored dichotomously (for example, right/wrong).

Each of the five sections has its own set of brief directions which, although similar, differ slightly. For example, each item in one subscale consists of a stimulus figure with four multiple-choice drawings beneath it. The assessor points to the stimulus item and says, 'Look at this,' then points to the answers and says, 'Find it here.' The subject points to one of the four drawings to indicate his or her response. The assessor has only to circle the child's response on the scoring sheet. The correct answers are printed in bold on the scoring sheet. The raw score is obtained by summing the number of correct responses. Charts in the test manual are then used to convert the raw score into either a perceptual age and/or a perceptual quotient (Colarusso and Hammill 1996). Summary overviews of the MVPT and the MVPT-R are presented in Tables 2 and 3.

Table 2. Summary overview of the *Motor-Free Test of Visual Perception*

Purpose	– Descriptive – Measures overall visual perceptual processing with minimal motor responses required
Age-range	– 4 to 8 years of age
Equipment	– Manual, test plate book, score sheet, stopwatch, pencil
Time to administer	– 10-15 minutes
Time to score	– 5 minutes
Scoring	– Accurate responses of 1 point are added for a raw score – Raw scores are converted to perceptual ages and perceptual quotients
Scale construction	– 36 items in a multiple-choice format – Includes five areas of visual perception: visual discrimination, visual figure ground, visual memory, visual closure and visual spatial relationships – Item difficulty: p = 0.12-1.00 – Item/total test intercorrelation: 0.08-1.00
Standardisation	– Normative data collected on 881 normal American children, 4 to 8 years of age, from 22 US states in 1972 version – Normative data sample based on US population for ethnicity, socioeconomic status and gender characteristics – Freedom from item bias was demonstrated by the use of delta values that yielded high correlations (0.78 to 0.92) for all racial groups
Reliability	– Intrarater: not reported – Interrater: not completed – Test-retest: 0.77-0.83 for different ages @ 20 days; 0.81 for total – Spearman Brown Split-Half: 0.81-0.84; 0.88 for total test – Kuder-Richardson: 0.71-0.82; 0.86 for total test was reported for ages 5 through age years, owing to small sample of 4-year-olds
Validity	– Content validity: based on item analyses as well as the five visual perceptual categories proposed by Chalfant and Scheffelin (1969) – Construct validity: age differentiation, internal consistency – Discriminant validity: MVPT was able to differentiate between visual perceptual performances of children at age levels 4 to 8 years; evidence of discrimination for group differentiation – Criterion-related validity: not reported/discussed in MVPT manual – Concurrent validity: 0.38-0.60 with *Frostig Developmental Test of Visual Perception;* 0.27-0.74 with *Developmental Test of Visual Perception – 2*

	0.40 with Matching subscale of *Metropolitan Readiness Tests* 0.37-0.42 with Word Study Skills and Arithmetic subscales of *Stanford Achievement Tests (Primary)* 0.33-0.46 *with Durrell Analysis of Reading Difficulties* 0.31 with *Slosson Intelligence Test* (significant at the 0.05 level) 0.32 with *Pintner-Cunningham Primary Test* (all other correlations significant at 0.01 level)
Cost (in US dollars/British pounds sterling) for MVPT	– Kit: $85.00/£70.48 – Manual: $27.00/£24.00 – Test plate: $40.00/£33.00 – Record forms: $16.00/£13.00 per package of 50 – Specimen set: $26.00/£22.00
Cost (in US dollars/British pounds sterling) for MVPT-V	– Kit: $85.00/£70.48 – Manual: $27.00/£24.00 – Test plate: $40.00/£33.00 – Record forms: $16.00/£13.00 per package of 50
Contact details of supplier	MD Angus & Associates Limited, 2nd floor, 2639 Kingsway Avenue, Port Coquitlam, British Columbia, Canada V3C 1T5. Phone: (604) 464-7919 Fax: (604) 941-1705 Email: mdangus@psychtest.com Website: www.psychtest.com

Table 3. Summary overview of the *Motor-Free Test of Visual Perception – Revised*

Purpose	– Descriptive – Measures overall visual perceptual processing with minimal motor responses required – May be used for screening, diagnosis and research
Age-range	– 4 to 12 years of age
Equipment	– Manual, test plate book, score sheet, stopwatch, pencil
Time to administer	– 10-15 minutes
Time to score	– 5 minutes
Scoring	– Accurate responses of 1 point are added for a raw score – Raw scores are converted to perceptual ages and perceptual quotients
Scale construction	– 40 items in a multiple-choice format – Includes five areas of visual perception: visual discrimination, visual figure ground, visual memory, visual closure and visual spatial relationships – Item difficulty: p = 0.12-1.00 – Item/total test intercorrelation: 0.08-1.00
Standardisation	– New normative data collected in 1996 revision on 912 normal children from Georgia and northern California – Normative data sample based on US population for ethnicity, socioeconomic status and gender characteristics – Freedom from item bias was demonstrated by the use of delta values that yielded high correlations (0.78 to 0.92) for all racial groups
Reliability	– Intrarater: not reported – Interrater: not completed – Test-retest: 0.77-0.83 for different ages @ 20 days; 0.81 for total – Spearman Brown Split-Half: 0.81-0.84; 0.88 for total test – Kuder-Richardson: 0.71-0.82; 0.86 for total test was reported for ages 5 through age years, owing to small sample of 4-year-olds
Validity	– Content validity: based on item analyses as well as the five visual perceptual categories proposed by Chalfant and Scheffelin (1969) – Construct validity: age differentiation, internal consistency – Discriminant validity: MVPT was able to differentiate between visual perceptual performances of children at age levels 4 to 12 years; evidence of discrimination for group differentiation – Criterion-related validity: not reported/discussed in MVPT-R manual – Concurrent validity: 0.38-0.60 with *Frostig Developmental Test of Visual Perception;* 0.27-0.74 with *Developmental Test of Visual Perception – 2* 0.40 with Matching subscale of *Metropolitan Readiness Tests* 0.37-0.42 with Word Study Skills and Arithmetic subscales of *Stanford Achievement Tests (Primary)* 0.33-0.46 *with Durrell Analysis of Reading Difficulties* 0.31 with *Slosson Intelligence Test* (significant at the 0.05 level) 0.32 with *Pintner-Cunningham Primary Test* (all other correlations significant at 0.01 level)
Cost (in US dollars/British pounds sterling) for MVPT-R	– Kit: $85.00/£70.48 – Manual: $27.00/£24.00 – Test plate: $40.00/£33.00 – Record forms: $16.00/£13.00 per package of 50 – Specimen set: $26.00/£22.00
Cost (in US dollars/British pounds sterling) for MVPT-V	– Kit: $85.00/£70.48 – Manual: $27.00/£24.00 – Test plate: $40.00/£33.00 – Record forms: $16.00/£13.00 per package of 50
Contact details of supplier	MD Angus & Associates Limited, 2nd floor, 2639 Kingsway Avenue, Port Coquitlam, British Columbia, Canada V3C 1T5. Phone: (604) 464-7919 Fax: (604) 941-1705 Email: mdangus@psychtest.com Website: www.psychtest.com

The MVPT-R emphasises visual recognition and discrimination of items, shapes and designs while limiting the motor response required. It is designed for screening, diagnostic and research purposes, for use by teachers, psychologists, educational specialists, rehabilitation therapists and others who require a quick measure of overall visual perceptual processing ability in children and adults. According to Bologna (2001), the MVPT-R has been used with both children and adults in a wide range of clinical populations. It can be used with both normal children and adults as well as those with neurological dysfunctions, such as cerebral palsy or traumatic brain injury. Bologna (2001, para 1) stated:

> Since the MVPT-R does not rely on graphemic responses, unlike many other visual perceptual measures, it may be particularly useful with populations who are motorically impaired.

However, the MVPT-R authors did not perform any analyses to confirm group differences.

One of the weaknesses of the MVPT-R is that, although it has adequate reliability, it has limited construct validity reported in its manual (Chu and Chia 1997). No new information in terms of validity or reliability is reported in the revised edition. The authors simply correlated the MVPT with the MVPT-R. Based on the correlation results, the test developers made the assumption that:

> the extremely high correlation (r = .85) between the MVPT and MVPT-R indicates that the addition of four plates has not altered the test in any substantive way. It would be reasonable to expect, then, that reliability and validity coefficients would not differ between the MVPT and MVPT-R. Comparisons of the original MVPT and other tests of visual perception, achievement, readiness and intelligence can be expected to hold for the MVPT-R as well (Colarusso and Hammill 1996, p19).

This means that the reliability and validity sections of the MVPT-R are based on data from the original 1972 MVPT norming study. However, since the MVPT was recently revised, it would have been proactive and timely for the test developers to take the opportunity to update the reliability and validity information as well. The assumption that simply correlating the original version of the MVPT with the revised version would be truly valid is questionable at best. It would have added greater credence to the measurement properties of the MVPT-R to have included more current and extensive reliability and validity studies with the revised version. As Burtner et al (2002b, p27) noted, 'although the authors cite previous reliability and validity studies on the MVPT as support for the revised test [MVPT-R], no psychometric studies have been completed on the MVPT-R'.

A special version of the MVPT was developed by an occupational therapist for use with adults, with the original 36 items arranged vertically instead of horizontally, known as the *Motor-Free Visual Perception Test – Vertical* (MVPT-V) (Mercier et al 1996). It was designed to eliminate the effect of visual field neglect impairments or neglect since the original version of the MVPT required left-to-right visual scanning ability (Chu and Chia 1997). MVPT-V stimuli are presented vertically at visual midline instead of horizontally across the page. This presentation allows for an accurate assessment of visual perceptual abilities in adults who may have hemifield visual neglect, common with a cerebrovascular accident or a traumatic brain injury. Hemifield visual neglect interferes with a person's ability to attend to a portion of the visual field, causing him or her to miss answer choices presented in one part of the visual field even though vision *per se* is normal. Some learning disabled people show a similar visual attentional deficit (due to abnormal visual saccades). MVPT-V raw scores are converted to standardised scores; norm tables are presented for adults with no history of head injury, as well as for head-injured adults with and without hemifield visual neglect. An updated version of the MVPT-V with the 40 items arranged vertically instead of horizontally has not been published to date.

Standardisation of the MVPT-R

The MVPT-R was standardised on 912 children, aged 4-11 years and residing in Georgia and northern California. The subjects, nearly equally distributed between boys and girls, were not identified as having motor, sensory or learning disabilities. Their racial composition was weighted slightly more heavily toward minority groups than the percentage distribution in the American population at large. Their demographic characteristics were as follows: 10% black, 63% white, 16% Hispanic and 11% of other racial groups (Colarusso and Hammill 1996). According to Volpe-Johnstone (2001), the MVPT-R seems relatively pure for item bias. This was demonstrated by the use of delta values that yielded high correlations (0.78 to 0.92) for all racial groups, with no significant differences upon comparison.

When the original version of the MVPT was developed, a total of 150 items were designed for their potential for eliciting deviations in the visual perceptual ability of children. After an initial evaluation, 45 of the 150 items were eliminated. The preliminary form was then administered to a group of 119 children, ranging from 5 to 7 years of age. The final form of the original MVPT was compiled by selecting the original 36 items that appeared to have the most acceptable validity and levels of difficulty (Colarusso and Hammill 1996). Valid items had point biserial correlations with the total test score of between 0.30 and 0.80. Items that fell between the 15 and 90 percentile level of difficulty at the different age-ranges were considered to be potential items for the MVPT. The original 36 scale items were then grouped according to the perceptual category that they represented and arranged in order of difficulty from easy to hard.

In 1996, when revising the MVPT, Colarusso and Hammill added four more plates and expanded the norms. The selection of individual test items for the revised edition was determined by point biserial correlation of each potential item with the total score. Those yielding coefficients between 0.30 and 0.80 were considered acceptable for inclusion in the MVPT-R.

Reliability of the MVPT-R

Reliability measures were not calculated for the revised edition of the MVPT and are not available for the expanded age-range. Similarly, the validity coefficients offered reflect studies with the original MVPT. Bologna (2001) believed that strong correlations between the original MVPT and the MVPT-R supported the carry-over of both reliability and validity measures from the original edition to the revised version. However, despite adequate test reliability levels, the reliability information reported in the MVPT-R manual is still rather scant at best (see Table 3). Newer and more up-to-date reliability studies very much need to be included in the MVPT-R manual. This should be considered a major limitation of the MVPT-R.

Since the MVPT-R authors rely on previous reliability studies on the MVPT as support for the revised test, reliability information for the MVPT will be reported. Three types of reliability procedures were performed on the original MVPT: test-retest, split-half and Kuder-Richardson-20. Interrater reliability was not investigated. The test-retest reliability of the MVPT was based on a group of 167 children, who were re-tested after a 20-day interval. The resulting coefficients ranged from 0.77 to 0.83 at different age levels with a mean coefficient of 0.81 for the total sample (Colarusso and Hammill 1996), thus demonstrating adequate levels of test-retest reliability.

To determine the consistency of the MVPT in regard to content sampling, split-half reliability procedures were employed. Pearson product moment correlation coefficients were calculated between odd-numbered and even-numbered items and were then corrected using the Spearman-Brown formula. The resulting coefficients ranged from 0.81 to 0.84 at various age levels; the mean for the total sample was 0.88 (Colarusso and Hammill 1996), demonstrating acceptable reliability. The total standardisation population was also used to determine the homogeneity of the scale items. The Kuder-Richardson-20 was used for this analysis. Correlation coefficients were calculated for each age level and ranged from 0.71 to 0.82 with a mean of 0.86, indicating adequate test reliability (Colarusso and Hammill 1996).

Only one recent study that evaluated the reliability of the MVPT-R has been reported in the literature to date. Burtner et al (2002b) administered the MVPT-R to a group of 38 children with identified learning disabilities and 37 children with typical development (aged 7 to 10 years) on two separate occasions within a 2.5 week window of time. Intra-class correlations for perceptual quotient scores ranged from 0.63 to 0.79 and perceptual age scores ranged from 0.69 to 0.86. Pearson product moment correlations for perceptual quotient scores ranged from 0.70 to 0.80 and perceptual age scores ranged from 0.77 to 0.87. The results of the study by Burtner et al (2002b) indicated that the MVPT-R has moderate test-retest reliability, with more stability in visual perceptual scores for children with learning disabilities.

Validity of the MVPT-R

Again, since the MVPT-R authors cite previous validity studies on the MVPT as support for the revised instrument, only validity information for the MVPT is included. Two questions were posed in order to determine the validity of the original version of the MVPT. Does the MVPT measure the construct of visual perception and, if so, how well does it do so? Three types of validity were considered: content, criterion-related and construct. Content validity was assessed by examining the content of the MVPT to determine whether all aspects of visual perception were included in it. To ensure content validity, items in the MVPT were included under the five visual perception categories proposed by Chalfant and Scheffelin (1969). The work of Chalfant and Scheffelin is now quite dated; therefore, adopting a more current theoretical model on which to base the MVPT-R would have been prudent and timely.

To validate the MVPT's constructs, three types of construct validity were considered: age discrimination, correlations with similar instruments and internal consistency. Since visual perceptual skills are widely reported to be developmental, it was expected that scale scores would exhibit a progressive increase with respect to subject ages. The authors of the MVPT randomly selected 40 subjects from each age level and subjected their scores to an analysis of variance procedure. The result yielded an F ratio significant at the 0.01 level of confidence (Colarusso and Hammill 1996). This was significant since it demonstrated that the MVPT exhibited acceptable levels of discriminant validity because it was able to differentiate between the visual perceptual performance scores of children at each age level. However, the MVPT-R manual did not provide information showing that the test can distinguish accurately between people who are known to have different levels of the construct due to poor neurophysiological growth or other known pathology. Criterion-related validity was not discussed in the MVPT-R manual, but it seemed likely that performance on the MVPT-R could be used to estimate current status and not be used in a predictive way.

Construct validity was also demonstrated by correlating the original MVPT with three other types of general instruments: visual-motor, school achievement and intelligence (see Table 2). The visual-motor instruments with which the authors correlated the original MVPT were the *Marianne Frostig Developmental Test of Visual Perception* (Frostig et al 1966) and the Copying and Matching Subtests from the *Metropolitan Readiness Tests* (Hildreth et al 1965). Coefficients ranged from 0.31 to 0.73, with a median of 0.49. When the MVPT was correlated with two school achievement instruments, the *Durrell Analysis of Reading Difficulties* (Durrell 1955), the *Metropolitan Readiness Tests* and the *Stanford Achievement Tests* (Kelly et al 1964), coefficients ranged from 0.03 to 0.51, with a median of 0.38. Finally, a coefficient of 0.31 was found with the *Slosson Intelligence Test* (Slosson 1963) and 0.32 with the *Pintner-Cunningham Primary Test* (Pintner and Cunningham 1965), the intelligence tests that were correlated with the MVPT.

In summary, the MVPT correlated higher with measures of visual perception (median r = 0.49) than it did with tests of intelligence (median r = 0.31) or school performance (median r= 0.38). Colarusso and Hammill (1996), therefore,

concluded that the MVPT measured the construct of visual perception adequately. The lower proportion of common variance with intelligence and school performance tests in contrast to the higher common variance with visual perception supported the notion of validity of the MVPT. However, these instruments are not only quite old, but were also correlated with the original version of the MVPT; therefore, repeating the correlation studies with more up-to-date instruments would add more credible and much needed evidence to support the use of the revised version of the MVPT. As Volpe-Johnstone (2001, para 7) stated:

> A criticism is that these test coefficients were based on infrequently used tests, tests that have since been renormed and/or revised in some important way, or tests that were not highly reliable themselves.

The third type of construct validity that was considered was internal consistency. To determine this, biserial correlations between 'pass-fail' on each item and the total test score were computed with plates 1-36, evidencing statistical significance at least once for the age-range of 5-7 years. Only those items yielding significant item-test correlations were retained in the final version of the MVPT, which contributed to the psychometric strength of the MVPT but not necessarily to that of the MVPT-R.

In summary, the validity results reported in the manual of the revised MVPT-R are dated and limited since the validity coefficients offered reflect studies with the original version of the MVPT. The two developers of the MVPT make the questionable assumption that, by simply having a high degree of correlation between the MVPT and the MVPT-R, the psychometric properties of the 1972 MVPT version can be generalised to the MVPT-R. If Colarusso and Hammill had truly wanted to revise and update the original version of the MVPT, they needed to include an expanded number of validity studies derived from a larger, more current normative sample in the MVPT-R manual.

Results obtained from the MVPT-R

Five components of motor-free visual perception are sampled by the MVPT-R: spatial relationships, visual discrimination, figure-ground discrimination, visual closure and visual memory. Although the MVPT-R provides items in each of these areas, only a single composite score is generated, reflecting a general perceptual ability. Colarusso and Hammill (1996) clearly warned against attempting to use item cluster scores as measures of subskills of visual perception, citing significant interrelatedness among these abilities. Volpe-Johnstone (2001) believed that this suggestion was a good one since there were too few items in some groupings (such as spatial relationships and visual discrimination) to make definitive statements. Further, the authors neither established whether these five areas were mutually exclusive, nor adequately defined the areas.

Scoring the MVPT-R consists of simply summing the number of correct responses, then comparing that raw score with the correct column in a normative table to derive a perceptual quotient and a perceptual age. The perceptual quotient, like an IQ score, has a mean of 100 and a standard deviation of 15. A perceptual quotient of 85 or less (1 standard deviation below the mean) is considered indicative of visual perceptual inadequacy. Perceptual age is reported as a range (based on the mean and standard error of measurement) and is generally used as an easily interpreted value for lay persons.

Critique of the MVPT-R

The benefits of the MVPT-R include easy administration and scoring, clear and simple instructions in the manual and a total testing time of approximately 10 minutes. Additionally, since no verbal responses are required, the MVPT-R can be used for subjects with limited language ability, the receptive language requirements are minimal and it can easily be interpreted for use in other languages. Further, additional instructions are permitted on trial items and a slow response time is not penalised. Despite its positive points, the MVPT-R does have a number of inherent limitations associated with it.

For example, the MVPT-R manual offers little discussion about interpreting its results. It simply states that any score below one standard deviation (perceptual quotient of 85) should be considered a deficit. Although a short list of references for remediation is provided, the authors fail to discuss the relationship between the perceptual quotient and a subject's IQ score in the manual (Volpe-Johnstone 2001).

Despite these shortcomings, Ryan (1988) believed that the original MVPT was a model of thorough and thoughtful instrument development. Because item selection was researched thoroughly and carefully, Ryan (1988) claimed that the original MVPT had excellent validity. Its test-retest reliability correlations varied from 0.77 to 0.83 and its split-half correlations ranged from 0.81 to 0.84 which, he said, 'demonstrate excellent consistency and reliability' (p347). However, these assumptions are questionable at best.

Unlike Ryan (1988), Rosen (1978) believed that no clear rationale or evidence was provided as to why a motor-free test of visual perception was desirable for the screening and/or diagnosis of visual perceptual dysfunction. Specifically, he claimed that the reason that such a separation should be important in evaluating typical children was not clearly reported in the MVPT. Colarusso and Hammill (1996) claimed that, while motor and visual perception skills are often clearly associated, they can also be very separate abilities. However, this is not fully explained, documented or delineated in the MVPT or MVPT-R manuals. Rosen (1978) therefore stated that, in order for the MVPT to evaluate motor-free skills in terms of screening and diagnosis, 'a far more adequate rationale than is available in this manual is needed' (p1418). Rosen (1978) also expected that there was a potential for the unsophisticated

user of the MVPT to assume that what might be necessary for the evaluation of exceptional children would hold true in the evaluation of typical children. He added:

> If the MVPT is a measure of motor-free visual perception, we need to know how important it is to measure such an ability and what useful or critical outcomes ... motor-free visual perception abilities contribute (p1418).

Furthermore, the authors of the MVPT contended that, since it has moderately high correlations with other visual-motor instruments and lower correlations with tests of achievement and intelligence, the original MVPT did in fact measure the theoretical construct of visual perception. However, the medial correlation of 0.49 between the original MVPT and other instruments indicated that the various perceptual instruments were not measuring the same construct. Noticing the lack of comparability between the samples of subjects in the data who received the perception tests, and those samples that received the achievement and intelligence tests, Rosen concluded that 'the comparison of correlations leads to tenuous if not unsubstantiated conclusions' (1978, p1418).

There are also problems with the interpretation of the normative data (Bologna 2001). Although the MVPT developers did caution that the perceptual age and perceptual quotients derived from raw scores should not be interpreted without considering the standard error of measurement, it is not known why they used the split-half reliabilities in calculating the standard error of measurement, especially since the Kuder-Richardson coefficients were lower than the split-half data in all cases (Rosen 1978). Similarly, in reporting an overall standard error of measurement, the MVPT authors used the combined group data, but they used the individual age-group data for calculating perceptual quotients. However, as Rosen noted, 'the use of a single standard error of measurement for tables built around different age groups [has the potential to] lead to misclassification problems in screening and in subsequent remediation of pupils' (1978, p1418). In fact, the authors' suggestion that a perceptual quotient of 85 or less (minus one standard deviation) be the criterion for below-average performance on the original MVPT 'appears not to be defended by either the validity or the reliability data available' (Rosen 1978, p1418).

Nevertheless, the original version of the MVPT is not without its defenders. Ryan (1988) stated:

> The MVPT appears to be a beautifully developed psychometric [tool] .... The authors should be commended for their careful and thorough item selection. Furthermore, the test is short and easy to administer and score. The instrument has good norms and excellent reliability (p348).

But even Ryan (1988) raised concerns about the MVPT's validity and the utility of its visual perception construct, saying that, despite its beauty, it is 'of questionable practical use' (p348). These concerns have been echoed by Rosen (1978).

In an attempt to address these concerns, the authors of the MVPT have begun to perform the necessary validity studies, but the populations being used are so narrow and restricted that the results cannot be generalised. Similarly, the behaviours measured by the MVPT do not readily generalise to behaviours within the classroom. For example, the vast majority of stimulus items on the MVPT are nonlinguistic in nature. However, since a school's emphasis is on teaching reading in a child's early years, the visual perception of linguistic figures is clearly the most critical (Rosen 1978).

Although Rosen (1978) questioned the validity of the original MVPT, the test authors maintained that it contained content validity because of the way in which the items were selected. Despite this fact, its construct validity and criterion-related validity are more problematic (Ryan 1988). Another major limitation is the reliability and validity data of the 1996 revision being based on the 1972 sample, as well as no research data (except the high pass rate in the item analysis summary) being cited to support the idea that the visual perceptual system is completely developed by the age of 10 years 11 months. There was no evidence that the four additional plates substantially discriminated at half-yearly intervals from 9 years to 11 years 6 months, which could then have been extrapolated to adult populations based on item difficulty levels. Volpe-Johnstone (2001) reported that based on her administration of the MVPT-R to a group of 17-year-old females, no new information was attained because of the four additional plates. Burtner et al (1997) outlined two major limitations of the MVPT-R: the lack of complete re-standardisation of the revised test for all age-groups and the absence of current psychometric studies for the MVPT-R.

Colarusso and Hammill (1972, 1996) attempted to demonstrate construct validity by correlating it with other types of scales: visual-motor, school achievement and intelligence. They maintained that high correlations between the MVPT and visual-motor tests and lower correlations with achievement and intelligence tests provided supportive evidence that the MVPT definitively measured motor-free visual perception. For example, the correlations with the visual-motor scales, such as the *Frostig Developmental Test of Visual Perception* and the Copying and Matching subtests from the *Metropolitan Readiness Tests*, were in the moderate range; and when the MVPT was correlated with intelligence tests, the correlations ranged from 0.31 to 0.32. On the surface, these data appear impressive; however, a closer examination of these validity studies reveals their flaws:

> Half of the studies used less than 50 subjects. Similarly, in all of the studies, most of the subjects were lower-class, urban minorities. Consequently, the most that can be said for the MVPT is that it may be valid for this population only (Ryan 1988, p348).

Since the normative sample was so small and narrow, Ryan (1988) believed that it was possible that a third variable, such as exposure to a certain type of preschool performance, was in fact responsible for the results obtained. Volpe-Johnstone (2001) also noted that the correlation data between the MVPT-R and other tests of visual perception did not describe the children in the comparison.

Another significant disadvantage of the MVPT-R is that it offers only one global score of visual perception. Since visual perception involves many discrete types of individual perceptual skills, the MVPT-R lacks the ability to assess a subject's abilities in terms of specific subtypes of motor-free visual perception, such as visual memory, visual figure ground and visual discrimination. The combination of all these subskills into one global visual perceptual score results in information that is of little practical importance or clinical use. If nothing else, the ability to look at patterns and to assess strengths and weaknesses is lost (Ryan 1988).

Conclusion

The MVPT claims to be 'a quick practical screening and diagnostic instrument, but inadequate evidence is presented to substantiate its validity for either screening or diagnosis. Consequently, the MVPT cannot be recommended in its present state' (Rosen 1978, p1419). Even though the MVPT-R has been revised recently by its two original authors, little has been done to address issues related to its reliability and validity. Evidence of criterion-related validity and construct validity, in particular, is still not sufficient. The rationale for measuring motor-free visual perception is also not well developed in the MVPT-R manual and needs to be expanded. In addition, the issue of summing the scores from the five motor-free subscales is questionable. What the final MVPT-R summed score really measures in terms of screening evaluation or diagnosis is also lacking. At this stage, the clinical use of the MVPT-R is questionable. Bologna (2001, para 1) stated that the MVPT-R 'will be useful within its limited scope'. At best, it should be used and interpreted by occupational therapists with caution.

Acknowledgements

Acknowledgements are extended to the Children's Hospital of Eastern Ontario Research Institute, Ottawa, Ontario, Canada, and the Bloorview Children's Hospital Foundation, Toronto, Ontario, Canada, for their financial support in the form of a research grant that made the completion of this critical review possible, as part of a larger study examining the measurement properties of visual perceptual instruments used by paediatric occupational therapists.

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