

## Tactual profile. Reliability and validity of the instrument

Neeltje M. Janssen<sup>a,b,\*</sup>, Ans J. Withagen<sup>a</sup>, Mathijs P.J. Vervloed<sup>c</sup>

<sup>a</sup>*Visio, National Foundation for Education of the Visually Impaired and Blind, The Netherlands*

<sup>b</sup>*In Sight, a Society which fosters application-oriented scientific research that supports the needs of people with a visual impairment, The Netherlands*

<sup>c</sup>*Radboud University Nijmegen, The Netherlands*

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**Abstract.** Tactual Profile is an observation instrument for charting the tactual functioning of children (age 0–16) with a severe visual impairment. In the period 2002–2004, a study was executed to determine basic psychometric qualities of Tactual Profile: difficulty level, test–retest reliability, inter-rater reliability and construct validity. The results of the study showed that most items had an acceptable difficulty level. There was a strong correlation between two administrations of the instrument. The inter-rater reliability was moderate and the correlation between Tactual Profile and haptic intelligence tests was higher than the correlation between Tactual Profile and verbal intelligence tests. The study showed that Tactual Profile is a reliable and valid instrument. © 2005 Elsevier B.V. All rights reserved.

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### 1. Introduction

Tactual Profile is an instrument which provides a procedure to assess the tactual functioning in children who are blind or have a severe visual impairment, from birth up to 15 years of age. The tactile demands the child has to meet in its environment served as a starting point for the construction of the instrument. Tactual perception and functioning are explicitly viewed in a broader context than just reading Braille or understanding geographical maps and graphics. The instrument was developed by the Visio, National Foundation for the Visually Impaired and Blind, in The Netherlands. The basis of Tactual

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\* Corresponding author. Oud Bussummerweg 76, 1272 RX, Huizen, The Netherlands. Tel.: +31 35 577 33 00; fax: +31 35 577 33 09.

*E-mail address:* neeltjelijanssen@visio.nu (N.M. Janssen).

Profile is the combined practical experience of professionals working with blind children, scientific literature on tactual functioning in blind and visually impaired children [1–9], and a group of experts on the sense of touch.

Tactual Profile provides items, graded according to age-level and domain of tactual functioning. There are 6 different age-groups: 0–2; 2–4; 4–6; 6–9; 9–12; 12–16 years of age. Tactual functioning is divided into the following domains:

- Tactual sensory functioning, which refers to passive tactual perception
- Tactual motor functioning, which refers to tactual perception that requires motor proficiency
- Tactual perceptual functioning, which refers to the interpretation of tactual information
- Practical skills. These are the skills necessary to function well in daily living situations.

In 2001, the first version of Tactual Profile was subjected to a validation study [10]. The aim of this validation research was to investigate the content validation of the instrument and a process evaluation of Tactual Profile. Based on the findings of this study, a second version of Tactual Profile was constructed. In September 2002, the current study started. Goal of this study was to determine basic psychometric qualities of Tactual Profile:

- difficulty level of each item
- test–retest reliability
- inter-rater reliability
- construct validity.

## **2. Material and methods**

### *2.1. The participants*

The participants in the study of the psychometric qualities were children in The Netherlands and Flanders (Belgium) from 0 up to 15 years of age, who are legally blind from birth and who did not have additional impairments. Out of 100 children contacted, 55 (55%) children participated.

### *2.2. The procedure*

The administrators who used Tactual Profile were trained on how to present and score the items. Procedural reliability was ensured by regular meetings in which administration and scoring were discussed.

All participants had two administrations of Tactual Profile by the same administrator, within a 2-week interval. Based on these administrations, the difficulty level of each item and the test–retest reliability was determined.

To measure the inter-rater reliability, two or more administrators scored the same session. This was accomplished by making at least one video-recording of each administrator. These video-recordings were scored by the remaining administrators, who did not do the administration.

To determine the construct validity, two kinds of tests were chosen:

- *Developmental/intelligence tests*

The expectation was that Tactual Profile correlates moderately with intelligence. Expected was that haptic intelligence would correlate well and that verbal intelligence would correlate less well with Tactual Profile.

To examine this expectation, all children were given a developmental or intelligence test. Because there is not a single intelligence test for the age range under study (0–15 years), three tests were chosen:

*The Reynell–Zinkin developmental scales:* 0–4 years. These developmental scales were designed for children with blindness or visual impairment.

*The verbal tests of the WPPSI:* 4–6 years. It was not possible to administer the non-verbal tests, because they were not adapted for blind children.

*The ITVIC:* 6–16 years, an intelligence test for blind children.

- *Tests that require haptic functioning*

It is important to have results from another test that examines haptic functioning. Unfortunately, there are, at this moment, no concurrent tests for haptic functioning available. Specific aspects of haptic functioning could be examined by the following tests:

*Tactile Tests of Basic Concepts (TTBC):* 4–7 1/2 years. The knowledge of basic concepts is tested by figures that the child can feel. For instance, 5 vertical lines and the child has to point the line in the middle.

*Tests of Mommers:* Haptic Figure Orientation Test and Haptic Greatness Discrimination Test: 7 1/2–13 1/2 years. The child has to decide, on touch, which figure is placed in a different orientation or which figure has a different size.

These tests to determine construct validity were administered after the assessment of Tactual Profile. To gather the data from these tests as objectively as possible, they were administered by other persons than the ones who administered Tactual Profile. These so-called ‘naive’ administrators were unaware of the goal of the study and were not familiar with the participants. All administrators received a training to administer the tests.

The tests were administered in a short period to cancel out maturation. The maximum period in which the tests had to be administered was 6 weeks. The aim was to test within a period of 4 weeks.

### 3. Results

#### 3.1. Difficulty level

During the administration, each child got items from his or her age-group, but also items from younger and/or older age-groups. This way, it was possible to compute three difficulty levels for each item:

1. difficulty level–young (p-young)
2. difficulty level (p)
3. difficulty level–old (p-old)

Table 1  
Correlations between first and second administration Tactual Profile (Spearman's rho)

Domain	Correlation*
Tactual sensory functioning	0.87
Tactual motor functioning	0.78
Tactual perceptual functioning	0.86
Tactual Profile (total score)	0.94

\* All correlations had a significant-level <0.01.

Age distribution of the items would be correct if  $p\text{-young} < p < p\text{-old}$ . For most of the items of Tactual Profile, this was indeed the case. A few items appeared to be too easy. This was especially the case with the A-items (age 0–2). Difficulty levels ( $p$ ) were mostly between 0.5 and 0.8.

### 3.2. Test–retest reliability

The test–retest reliability was only determined for the items that were observed. Items that could not be observed but had to be asked were excluded from this analysis, because they were only asked once. The items that were observed, were administered two times.

There was a strong correlation between the first administration of Tactual Profile and the second administration. Also the domains and categories had a strong correlation (Table 1).

### 3.3. Inter-rater reliability

There were five video-tapes that could be scored by the administrators. There were 3 administrators. The 15 Cohen's Kappa's that could be computed are depicted in Table 2.

### 3.4. Construct validity

Construct validity was determined by two kinds of tests: developmental/intelligence tests and haptic tests. Before computing the correlation between Tactual Profile and the intelligence tests, the intelligence tests' subtests were divided in verbal and non-verbal/haptic. Three out of eleven verbal subtests correlated significantly with Tactual Profile. These were the subtests 'Expressive Language, Vocabulary and Content' (Reynell), 'Verbal Analogies' (ITVIC) and 'Vocabulary' (ITVIC). The correlations were moderately strong (range 0.45–0.54). The correlation with the haptic subtests was stronger (range 0.49–0.68).

The haptic tests did not correlate significantly with Tactual Profile. The tests of Mommers correlated significantly with Tactual Profile (0.80), but after correlation with intelligence partialled out, the significant correlations disappeared. The correlation between the tests of Mommers and the ITVIC was 0.65 (significant at <0.01). The TTBC did not correlate significantly with the WPPSI.

Table 2  
Agreement between administrators (Cohen's Kappa)

Video-tape	Administrator 1 and 2	Administrator 1 and 3	Administrator 2 and 3
1	0.70**	0.77**	0.57**
2	0.40**	0.31*	0.61**
3	0.21	0.57**	0.24
4	0.36**	0.82**	0.46**
5	0.68**	0.61**	0.58**

\* Correlation is significant at 0.05 level.

\*\* Correlation is significant at 0.01 level.

#### 4. Conclusion

The difficulty levels of the items showed that a few items were too easy, especially the A-items. A possible explanation is that this group of children consisted of 5 children of 1 year old, and only 1 child younger than 1 year. The A-items that were too easy were mainly skills for children of 0 year. It is likely that most children 1 year and older will master these skills.

The test–retest analyses proved that Tactual Profile is a reliable instrument. The profile that the administrator gets after the first administration resembles the profile of the second administration.

The reliability of the administrators is reasonable, given the kind of test Tactual Profile is; that is, an observational instrument. Absolute differences between the administrators were low, namely nearest score-options. This means that if there was difference between the scores of two administrators, one administrator scored ‘mastered’, the other scored ‘partially mastered’. There are no other score-options between these two. Note that observer agreement is attenuated by the fact that observation from video did not allow the second and third observer to administer extra items.

The analyses for the construct validity showed a moderate correlation between Tactual Profile and intelligence. This correlation is strongest for the haptic subtests. It can be concluded that Tactual Profile measures something different than intelligence tests. It is plausible that Tactual Profile measures tactual functioning, although this cannot be concluded from the analyses of the haptic tests (TTBC and tests of Mommers). Despite the expectations, there was not a significant association between these haptic tests and Tactual Profile. A possible explanation is that the haptic tests tap not only haptic or tactual functioning but also something else, possibly problem solving skills or intelligence. Evidence for this explanation comes from the significant correlation between the tests of Mommers and the intelligence tests.

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