

## ORIGINAL ARTICLES

### Dental Investigations

#### BEHAVIOUR EVALUATION SCALES FOR PEDIATRIC DENTAL PATIENTS – REVIEW AND CLINICAL EXPERIENCE

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#### ШКАЛЫ ОЦЕНКИ ПОВЕДЕНИЯ ПРИ СТОМАТОЛОГИЧЕСКОМ ЛЕЧЕНИИ В ДЕТСКОМ ВОЗРАСТЕ – ОБЗОР ЛИТЕРАТУРЫ И СОБСТВЕННЫЙ КЛИНИЧЕСКИЙ ОПЫТ

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##### ABSTRACT

The present article makes a review of the relevant literature on the scales used in the assessment of behaviour of pediatric dental patients as well as presents the results we have had of using a modified Kurosu Behaviour Evaluation Scale to assess a study sample. The review makes a critical analysis of current evaluation methods and the design of assessment scales. The assessment tools most commonly used in pediatric dentistry are presented in a chronological order from the past to the present. The clinical study we conducted used a modified Behaviour Evaluation Scale developed by Kurosu for the assessment of the behaviour of children. The study showed that during dental treatment of children in the age range of 6 to 12 years the prevailing objective behaviour characteristics in accordance with Kurosu's behaviour evaluation scale are related to the eyes and the facial expression. The findings from the literature review and the results of our study warrant further studies to develop easy-to-use assessment tools that would enhance the objective assessment of behaviour.

**Key words:** *behaviour, evaluation scales, children*

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##### РЕЗЮМЕ

Целью настоящего исследования является обзор различных шкал оценки поведения при стоматологическом лечении в детском возрасте, описанных в современной научной специализированной литературе, а также представление результатов, полученных при апробации модифицированной шкалы оценки поведения Кюросу. Изготовленный нами литературный обзор представляет собой критический анализ методов оценки поведения и оформления использованных шкал. Представлен хронологический порядок появления и развития шкал оценки детского поведения, которые применялись за весь период от исторического прошлого и до наших дней. Собственное клиническое исследование представляет апробацию методики оценки поведения детей в стоматологической практике по модифицированной шкале поведения Кюросу. Клинические результаты показывают, что при стоматологическом лечении детей в возрасте от 6 до 12 лет, по Шкале оценки Кюросу объективно установленные доминирующие поведенческие характеристики связаны прежде всего с выражением лица и с глазами.

Сведения в литературе и результаты нашего клинического исследования являются основанием для продолжения наших исследований и для разработки инструментов оценки, которые облегчают её проведение в практике и повышают степень объективности при оценке поведения.

**Ключевые слова:** *поведение, шкалы оценки, детский возраст*

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## INTRODUCTION

Assessment of children based on their behaviour is one of the most important skills for pediatric dentists.<sup>1</sup> Behavioural dentistry is an interdisciplinary science. Its objective is to help a dental practitioner gain an understanding of the interpersonal social force that influences a patient's behaviour. There is a correlation between dental anxiety and behaviour. For this reason it is important for dentists to be able to evaluate behaviour in order to identify these patients who need special care in regard to their anxiety.<sup>2</sup> The child's emotional and behavioural response in the dental chair is a matter of serious concern to both practitioners and researchers in pedodontics. Many behavioural rating scales for evaluating child's behaviour on each dental visit have been reported in the literature. They are the most commonly used indexes of children's responses to dentistry. All of them are based on the two main assessment methods - praxeological observation and recording of behaviour.<sup>1,3</sup> Praxeology is a [deductive](#) study of understanding human [action](#) based on the fact that humans engage in purposeful behaviour.<sup>4</sup>

## AIM

The aim of this review article is to analyse different evaluation scales that are most commonly used to assess the behaviour in children.

## CHRONOLOGICAL DEVELOPMENT OF BEHAVIOUR EVALUATION SCALES

### FRANKL'S BEHAVIOUR RATING SCALE (FBRs)

Frankl's Behaviour Rating Scale, developed in 1962<sup>5</sup>, is one of the most widely used behaviour evaluation scales in pediatric dental research and in daily clinical practice. It classifies child behaviour into four groups according to the child's attitude and cooperation or lack of cooperation during dental treatment.<sup>5</sup> It consists of four behaviour categories ranging from definitely positive to definitely negative which are assigned by the treating clinician and

can be applied at various stages during treatment (Table 1). It is considered as one of the most reliable tools developed for behaviour rating of children in dental setting.<sup>6</sup> However this classification does not provide definite items for observation.

### MODIFICATION AND ADAPTATION OF FRANKL'S BEHAVIOUR RATING SCALE

In 1975 Wright proposed a modification of Frankl's Behaviour Rating Scale<sup>7</sup> (Table 1).

J. Machen and R. Johnson described an adaptation of Frankl's Behaviour Rating Scale (1991). According to the new version of the scale two independent raters evaluate children's behaviour in dental setting in the range from definitely positive to definitely negative at five different moments<sup>8</sup>:

1. Separation of the child from the parent
2. First reaction of the child in dental setting
3. Attitude towards the dental staff
4. Behaviour during the treatment
5. Behaviour after the treatment

### GLOBAL RATING SCALE (GRS)

Another scale for behaviour evaluation is the Global Rating Scale (1965). The 5-point Global Rating Scale of overall behaviour is scored by the child's dentist and is a measure of both the successful completion of treatment at the visit and of the dentist's perception of the child's anxiety (Table 2). It is simple to use and reliable to evaluate the responses of anxious pediatric patient to treatment.<sup>9</sup>

**Table 2.** Global Rating Scale

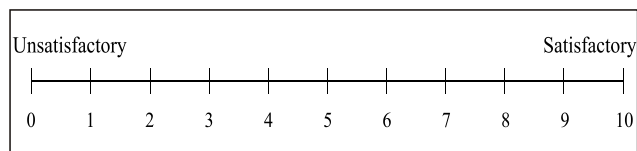
5 = excellent	
4 = very good	
3 = good	
2 = fair	
1 = poor/aborted	

**Table 1.** Wright's modification of Frankl's Behaviour Rating Scale (modification is in brackets)

Rating	Attitude	Definition
1 (--)	Definitely negative	Refusal of treatment, crying forcefully, fearful or any other overt evidence of extreme negativism.
2 (-)	Negative	Reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced, i.e. sullen, withdrawn.
3 (+)	Positive	Acceptance of treatment; at times curious, willingness to comply with the dentist, at times with reservation but patient follows the dentist's directions cooperatively.
4 (++)	Definitely positive	Good rapport with the dentist, interested in the dental procedures, laughing and enjoying the situation.

### VISUAL ANALOGUE SCALE (VAS)

Another scale, Visual Analogue Scale (VAS, 1969) consists of 10-cm horizontal line with two poles: unsatisfactory and satisfactory (Figure 1). It can be used both as a self-report and as an observational tool. A vertical line across the horizontal line is used to mark the operator's assessment of the child's behaviour. The point where the vertical line crosses the horizontal line is measured with a ruler to give a score to the nearest cm. The VAS



**Figure 1.** Visual Analog Scale

is validated for use with anxious dental patients<sup>10</sup> and when compared to other scales it is found to be more sensitive and simpler to use<sup>9</sup>.

### HOUP T CATEGORIAL RATING SCALE (HCRS)

Another scale which is popular among researchers is the one used by Houpt. Developed by Nazif (1971), this scale monitors and measures behaviour at specific time spots in the visit in each category (crying, co-operation, apprehension, sleep), (Table 3). The scores from the four categories of the Houpt scale are summed up to give an overall time-point score and then divided by the number of the

time-point periods. The Houpt Scale is found to be a reliable tool if used to score a patient's response to specific items of treatment, such as local anaesthetic injection.<sup>10</sup>

### WRIGHT'S CLASSIFICATION OF COOPERATIVENESS OF CHILDREN IN DENTAL OFFICE

Considering the fact that the dentist treating a child patient almost always assesses one aspect of behaviour – cooperativeness, Wright developed a new scale based on it. According to Wright children's behaviour may be characterised in one of the following ways: cooperative, potentially cooperative and lacking co-operative ability, as the term 'potentially co-operative' is preferred to the inaccurate term 'unco-operative'.<sup>7</sup> Wright's classification of children's cooperative behaviour in dental office (1975) is under the following categories:

- Cooperative children
- Children lacking cooperative ability
- Potentially cooperative children
  1. Uncontrolled behaviour
  2. Defiant behaviour
  3. Timid behaviour
  4. Tense cooperative behaviour
  5. Whining behaviour.

### BEHAVIOUR PROFILE RATING SCALE (BPRS)

The Behaviour Profile Rating Scale (BPRS) developed by Melamed's research group (1975) enables

**Table 3.** Houpt Categorical Rating Scale

<i>Rating for crying</i>		
1: Screaming, hysterical crying that demands attention		<input type="text"/>
2: Continuous, persistent crying that makes treatment difficult		
3: Intermittent, mild crying that does not interfere with treatment		
4: No crying		
<hr/>		
<i>Rating for cooperation</i>		
1: Violently resists/interrupting treatment		<input type="text"/>
2: Continuous movement making treatment difficult		
3: Minor movement/ intermittent that does not interfere with treatment		
4: No movement		
<hr/>		
<i>Rating for apprehension</i>		
1: Hysterical/disobeys all instructions		<input type="text"/>
2: Extremely anxious/ disobeys some instruction/ delays treatment		
3: Mildly anxious/ complies with support		
4: Calm/ relaxed/ follows instructions		
<hr/>		
<i>Rating for sleep</i>		
1: Fully awake, alert		<input type="text"/>
2: Drowsy, disorientated		
3: Asleep, intermittent		
4: Sound asleep		

the observer to record frequency of disruptive behaviour during 3-min observation periods. A weighting factor is used in computing the total score to assess behaviour considered by the dentists as more disruptive. It receives a higher weight than behaviour considered less disruptive. An inter-rater reliability coefficient of .97 is reported and scores on this measure correlate well with other measures of disruptive behaviour<sup>11</sup>, indicating that the BPRS is a useful means of assessing problem behaviour during dental treatment. Of the behavioural measures Melamed's BPRS is to be preferred to Frankl's Behaviour Rating Scale, Venham's and VAS. The main reason is that it measures the behaviour of the child more precisely and that it has superior psychometric properties.<sup>12</sup>

#### VENHAM BEHAVIOUR RATING SCALE (VBRIS)

Venham et al. introduced and explored the use of 6-point Cooperative Behavioural Scale (1980) also called Uncooperative Behaviour Rating Scale.<sup>13</sup> The scale describes child's behaviour in details and provides more information about pediatric patients with negative and disruptive behaviour. It is a six-point scale, with scale points anchored in objective, specific and readily-observable behaviour and classifies child's behaviour into six groups (Table 4). The dentist indicates the patient's behaviour by picking a number from 0 to 5 according the scale after the dental visit or at specific time spots of it. Venham et al. pointed out that the scale is a reliable and valid scale and provides interval level measurement. They found that the used behavioural labels accurately capture the essence and variable manifestations of 'uncooperative behaviour' in young

children. In the same survey a high inter-rater agreement is demonstrated and the scale is proven as an useful instrument for assessing child's responses to dental stress.<sup>13</sup>

#### KUROSU BEHAVIOUR EVALUATION SCALE (BES)

Kurosu et al. proposed a classification of child behaviour during dental treatment Behaviour Evaluation Scale (BES), that does provide 37 detailed definite items for observation.<sup>1</sup> Despite this advantage, this classification does not allow the easy observation of the 37 items in daily clinical practice. For this reason a video record of the examination is made for the evaluation of behaviour of all children. Then they are evaluated by one or several pediatric dentists, marking 'Yes' or 'No' for each of the observed item. Since some items included in the BES, such as tongue movement, could not be evaluated using a video record, 8 of the 37 BES items are excluded from the evaluation. The behaviour evaluation score developed by Kurosu classifies the behaviour of the children into three groups of difficulty by the expression of the behaviour for the dental equipment and following it's disturb for the dental treatment (Table 5).

The Behaviour Evaluation Scale (BES) is also well known in Japan and it was used for children's behaviour evaluation for the first time by Tsuchiya et al. in 1975. It is unknown and new to the pediatric dentists in Europe and USA. BES is first introduced by a study in English in May 2005<sup>1</sup> that describes the scale and its structure in details to the English-speaking dental researchers. Each item of the Kurosu Behaviour Evaluation Scale

**Table 4.** Venham Behaviour Rating Scale

Rating	Definition
0	Total cooperation, best possible working conditions, no crying or physical protest.
1	Mild, soft verbal protest or (quiet) crying as a signal of discomfort, but does not obstruct progress. Appropriate behaviour for procedure, i.e., slight start at injection, "ow" during drilling if hurting, etc.
2	Protest more prominent. Both crying and hand signals. May move head around making it hard to administer treatment. Protest more distracting and troublesome. However, child still complies with request to cooperate.
3	Protest presents real problem to dentist. Complies with demands reluctantly, requiring extra effort by dentist. Body movement.
4	Protest disrupts procedure, requires that all of the dentist's attention be directed toward the child's behaviour. Compliance eventually achieved after considerable effort by dentist, but without much actual physical restraint. (May require holding child's hands or the like to start). More prominent body movement.
5	General protest, no compliance or cooperation. Physical restraint is required.

**Table 5.** Distribution of positive answers for each item for the behaviour evaluation scale developed by Kurosu (total number of children n = 42)

Difficulty	Item	n	%
1	Wincing	5	11.9
	Closing the eyes	6	14.3
	Looking at the dental equipment	41	97.6
	Stiffening the face	11	26.2
	Rolling the eye	30	71.4
	Staring at the ceiling	12	28.6
	Looking at the fingertips of the dentist	41	97.6
	Looking at the face of dentist	37	88.1
	Linking	22	52.4
	Looking around	38	90.5
2	Moaning	17	40.5
	Crying softly	12	28.6
	Crying out 'Oh'	13	31
	Holding up the hands	23	54.8
	Putting hands over the chest	9	21.4
	Moving the hands	27	64.3
	Screaming, 'it hurts'	6	14.3
	Moving the legs up and down	22	52.4
	Screaming, 'No, no'	4	9.5
	Asking what are you going to do?	20	47.6
3	Moving the body left and right	5	11.9
	Putting hands over the mouth	11	26.2
	Moving the body up and down	11	26.2
	Shaking the legs	37	88.1
	Holding the hands of the dentist	7	16.7
	Shaking the head	17	40.5
	Nodding the head	15	35.7
	Beating off the equipment	0	-
	Crying loudly	6	14.3

has been translated from the original Japanese into English. These original English translations have been verified by back translation performed by two independent translators.

Studies investigating the behaviour of children in Bulgaria are conducted by Ilieva et al., who used a modification of Venham Cooperative Behavioural Scale<sup>14</sup>, and Colova et al., who used Frankl's Behaviour Rating Scale among patients 3-6 years of age<sup>15</sup>.

## OWN CLINICAL EXPERIENCE

### APPROBATION OF KUROSU BEHAVIOUR EVALUATION SCALE

Our study included 42 children (age range 6-12 years, mean age 7.51±1.5 years), regardless of

their dental fear and anxiety. The patients attended the department of Pediatric Dentistry, Faculty of Dental Medicine in Plovdiv, Bulgaria for treatment between May and December 2013. Informed consent was obtained from the parents or guardians of all children. During the initial oral examination, a video record of the examination was made for the evaluation of behaviour of all children. The modified Behaviour Evaluation Scale (BES), developed by Kurosu (Table 5), was used to assess the behaviour of each child. The videos were evaluated by two independent dentists.

The inter-rater agreement for the raters was found to be Kappa = 0.75, indicating substantial agreement among the two dentists.<sup>16</sup>

According to the BES, items that are dominant behaviours in more than 88% of the children are 'Looking at the dental equipment', 'Looking at the fingertips of the dentist', 'Looking at the face of dentist', 'Looking around' and 'Shaking the legs' (Table 5). Among these items, 4 of them concerned the eyes and the facial expression. The results of our study show that these items are highly frequent in the behaviour of children between 6 and 12 years. Whereas, items, that concerned with the limbs and sound signals, are rarely observed.

Our results are not consistent with the results obtained by Shinohara et al.<sup>1</sup> that showed that observations based on BES frequently indicated behaviours concerned with the children's limbs. This is due to the age range (3-9 years) of the study population and the fact that younger children cannot stabilize their gaze, indicating that these items cannot be useful for assessing younger children in clinical settings. However, our results confirm the results obtained later by the same authors' team in a study of older age group who found that dominant behaviours concerned the eyes and face.<sup>3</sup>

The present results are in line with child's intent at the age of middle childhood for inexhaustible striving to gather large amount of information and obtaining experience from the new social surrounding. This period is an exciting time of development of children's skills of self-awareness as well as acquirement of knowledge for new learning situations.<sup>17</sup>

The present study of *evaluation* of the *child's dental behaviour* using the modified Behaviour Evaluation Scale, developed by Kurosu, has been conducted for the first time in Bulgaria. The following conclusions can be drawn from it:

1. Facial expression is easily affected by dental treatment in 6-12-year-old children.
2. The observation of eye movement and eye contact with patients are needed eliminating the opportunity for conceiving negative imagination when children close their eyes.
3. The proper assessment of child behaviour helps the pediatric dentist to use appropriate management techniques and to plan subsequent dental visits. This ensures effective and efficient dental treatment.

## CONCLUSIONS

There is a wide variety of scales available to evaluate the behaviour of children in dental setting. Rating scales present a number of significant advantages. Raters can be readily trained to use a selected scale for a study in advance. The rating

procedure is quick, simple and non-intrusive. It is easily integrated in the ongoing clinical activities or research designs as well as an ease of administration and conceptualization. The obtained data can be analysed by appropriate statistical techniques.

However, behavioural observation research can be problematical as it is difficult to be totally objective when different coping strategies are used and some bias can occur. Although all scales can be used in clinical practice, the evaluation depends on the subjective assessment of the dental practitioner itself. Behaviour Evaluation Scale, developed by Kurosu, provides definite items for observation. However, it requires monitoring team, equipment and extra time.

The development of cheap lightweight digital and video cameras has greatly helped observational research, as the patient's behaviour can be scored objectively by a number of raters away from the dental office. Recording the video is also possible to check the reliability of the indexes used. Further studies of this behaviour scale are needed to confirm the obtained results in different age groups as well as to determine the reliability and validity of this measure.

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