DOI: 10.1111/j.1365-263X.2010.01072.x

INTERNATIONAL JOURNAL OF PAEDIATRIC DENTISTRY

Can drawing be considered a projective measure for children's distress in paediatric dentistry?

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International Journal of Paediatric Dentistry 2011; 21: 1–12

Background. Several tools have been developed for the measurement of emotional status of the child in paediatric dental clinics including nonverbal self-report techniques. Subjective methods like drawing and Child Drawing: Hospital (CD:H) score have recently been applied in hospitalized children. Studies, however, have not attempted to analyse children's drawings as an aid to investigate the subjective feelings of children in paediatric dental settings.

Aim. To assess drawing as a measure for child's distress in paediatric dental settings.

Design. Fifty-four children, aged 4–11 years, participated in this study. After finishing the first therapeutic session, the child was instructed to draw a picture of a person in a dental clinic. The pictures were scored using CD:H score sheet and the findings were compared with SEM and Frankl scores.

Results. CD:H was correlated with both Frankl (correlation coefficient = −0.550) and SEM (correlation coefficient = +0.483) scales ($P < 0.001$).

Conclusion. Drawing is a useful measure of children's emotional status in dental settings in a way that is easier, familiar and more enjoyable for the child patient.

Introduction

Accurate assessment of paediatric procedural distress is essential to clinical and research endeavours aimed at assisting children during invasive medical events. However, distress is a complex, multidimensional, and subjective phenomenon consisting of sensory and affective components[1]. Dental fear is related to a real, immediately present, specific stimulus (e.g., needles, drilling), whereas in the case of anxiety, the source of the threat is ambiguous, unclear, or not immediately present. However, an individual's emotional responses are almost the same in both situations[2,3]. Elements of fear can be divided into two categories: subjective (including emotions and cognitions) and objective (including behaviour and physiological reactions)[2,3]. The patient's subjective experience of dental treatment is the most important channel for their later behaviour – for example, avoiding behaviour[4,5].

Children experience difficulty with the abstract task of describing subjective experiences using verbal language, but do better matching internal states with pictorial representations of emotions[6–8]. Therefore, a child's self-report (i.e., what the child says) has generally been considered to be the 'gold standard' for assessments of pain and anxiety, despite its obvious limitations[9], for instance their limited level of cognitive development and poor language abilities[6,7,10]. However, self-reports have become the most common measure of pain obtained from paediatric patients[9,11].

There are few self-report instruments which do not rely on values and beliefs of an observer in paediatric dentistry. Some of these subjective tools include using multiple-choice questions (which require ability of reading)[12], Pain Thermometer (choosing among colours), and Visual Analogue Scale (VAS). VAS is one of the most reliable and valid measurement

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tools for self-report of pain in paediatric dentistry[13]. VAS shows a series of happy and sad faces, with the faces graded in increasing intensity between 'no pain' and 'worst pain possible'. However, this method runs the great risk of giving objective results as it is difficult to isolate a child's pain experience from other emotional states[9]. A failure to distinguish between anxiety and pain may result in children receiving inappropriate treatment for their current state (because different managements are required for pain and anxiety) or may decrease the likelihood that a child will receive medication should his/her distress be interpreted as anxiety rather than pain[9,14]. Therefore, these reflections highlight the necessity of using a new and appropriate self-report assessment tool to measure children's emotional status along with available methods for assessment of pain and/or anxiety in paediatric dentistry.

Currently, there is growing interest in the use of art as a means of facilitating communication with children[15]. Several authors have suggested that an appropriate way to collect information about children's perceptions and experiences is by means of projective self-report techniques such as drawings[7,16]. Children's drawings and narratives can provide a unique window into their inner experiences, particularly when they have experienced stress and anxiety[17]. Drawings are advantageous in that they are usually nondirective, require no simple right answers, and help identify feelings and desires that subjects may not be consciously aware of or able to express verbally, besides being nonthreatening[18]. Although drawing increases the amount of information the child reports, this increase does not occur at the expense of accuracy[17]. In clinical practice, drawings have commonly been used for decades by child psychiatrists and psychologists to analyse children's subjective feelings, fears, and other emotions like child's distress, anxiety, worries and anger[16]. Perhaps the most appealing clinical aspects of using drawings in assessment is that the nonverbal method transcends language limitations and cultural barriers, which often encountered with traditional verbal tests, and is child-focused information-gathering tool, which takes little time to administer and is usually enjoyable activity[19].

Human figure drawings are quick, inexpensive, and nonthreatening to children[16], and as assessment tools, have been widely used by clinicians, as early as 1920s by Goodenough and later by Koppitz[20–22]. Pelander *et al.* used drawing to estimate children's expectations of an ideal hospital[23]. Looman described the use of drawings to understand children's experiences, affected by Hurricane Katrina, related to traumatic displacement[17]. The usefulness of children's drawings in the diagnosis of headache was evaluated by Stafstorm[24]. Art therapy was conducted as a support for children with leukaemia during painful procedures[25]. In 1999, Child Drawing: Hospital (CD:H) was developed as a means of measuring anxiety of hospitalized school-aged children[6,7].

In the field of dentistry, Pond, in 1968, found stories concerned with pain, blood and other signs of aggression in a series of children's drawings collected by a dentist[26]. Following other attempts, in 1982, Sheskin *et al.* utilized drawings of children in a dental setting as an assessment tool for their anxiety, evaluating six criteria in their narratives[27]. In 1994, Klingberg *et al.* evaluated the validity of Children's Dental Fear Picture test (CDFP), which consisted of the pictures of animals in different stress-evoking dental care situations and five cards depicting children in five different related situations to be selected by children, and were compared with Children's Fear Survey Schedule (CFSS)[28].

In the light of current evidences, regarding utilizing drawings as anxiety assessment tools, a study with comprehensive evaluation of children's drawings in comparison to available behavioural indicators of anxiety deemed necessary. The aim of this study was to investigate the applicability of children's drawings as an indicator to measure children's level of distress comparing to our previous standards such as SEM and Frankl scales in the dental setting. Thus, in this study, it was hypothesized that children's drawings analysis can be a reliable assessment tool for evaluation of child's distress (pain and anxiety) during conventional paediatric dental procedures.

Materials and methods

Sample

The participants of this study included children attending the Department of Paediatric Dentistry, Tabriz University of Medical Sciences, for the treatment of carious primary and/or permanent teeth. The admitted children to this department are mostly referrals from the general dentists working in the area, or children under routine medical care in Tabriz Paediatric Hospital, which usually are referred to the Department of Paediatric Dentistry for comprehensive assessments as well as routine dental treatments, including DMFT assessment, fluoride application, fissure sealant placement, pulp therapies, fillings, extractions, and space maintenance. Once admitted, these children are examined by an undergraduate and a postgraduate student under the supervision of a paediatric dentist. A comprehensive medical and dental history is taken and a treatment plan is established for each patient.

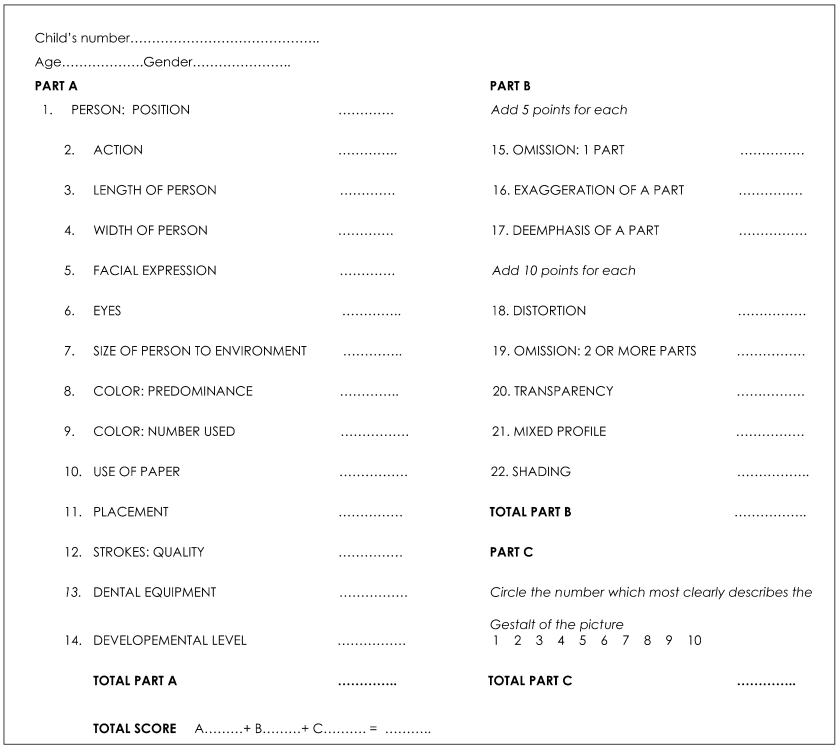
The following criteria were considered for inclusion in this study:

- 4–11 years of age[7,15–17,23,24], independent of sex, and ethnic characteristics
- Existence of carious primary teeth which needed pulp therapy and restorative treatment (children with the chief complaint of trauma who needed pulp therapy and /or restorative treatment, were also included in the study)
- Complete physical and mental health without any confounding medical history

The charts of all 641 subjects admitted and examined in the department of Paediatric dentistry, were carefully investigated. Of all the 641 charts available, 229 subjects were excluded due to their compromised physical and mental health history. Sixty-two were excluded regarding to their ages (less than 4 and more than 11 years old). Sixty-seven were excluded because they only needed extractions. Fifty-four subjects needed primary orthodontic treatments and were excluded from the study. Seventy-nine only needed preventive treatments and were excluded. Therefore, 150 subjects matched the inclusion criteria of this study. Sixty-five random numbers were taken from an online randomizing service (http://www.randomizer.com) supposed to be included in the study. From the randomized 65 subjects, 8 did not attend the treatment appointment for unknown reasons, and from the remaining children, 3 rejected to draw because they did not like to. Therefore, a total of 54 children participated in the study. All subjects received restorative and/ or pulp therapy after local anaesthesia in the first therapeutic session. SEM and Frankl scales along with the drawings were recorded from each subject at their first therapeutic session.

Methods

During the first therapeutic session, pulp therapy and/or restorative treatment was performed for subjects. CD:H as a self-report projective measure (Figs 1 and 2) along with the Sound, Eye, and Motor (SEM)[29] (Table 1) and Frankl[30,31] scales as behavioural measures of pain and distress were used. These observational scales have proved to be a valid means of assessing child dental anxiety status[29,30,32] The Frankl scale is rated according to the following criteria: Rating score 1: definitely negative: Refusal of treatment, crying forcefully, fearful or any other overt evidence of extreme negativism; Rating score 2: negative: Reluctant to accept treatment, uncooperative, some evidence of negative attitude but not pronounced, that is sullen, withdrawn; Rating score 3: positive: acceptance of treatment; at times cautious, willingness to comply with the dentist, at times with reservation but patient follows the dentist's direction cooperatively; Rating score 4: definitely positive: good rapport with the dentist, interested in dental procedures, laughing and enjoying the situation. The way of reaching to an overall score on frankl score in a dental setting, simply consists of summing the ratings an individual receives on the different measurement occasions including oral exam, during X-ray, injection, rubber dam placement, treatment procedure and during departure. For example, in the Frankl scale, a child received an overall positive rating if he had a positive


Child's number.....
Age.....Gender.....

PART A

1. PERSON: POSITION .....
2. ACTION .....
3. LENGTH OF PERSON .....
4. WIDTH OF PERSON .....
5. FACIAL EXPRESSION .....
6. EYES .....
7. SIZE OF PERSON TO ENVIRONMENT .....
8. COLOR: PREDOMINANCE .....
9. COLOR: NUMBER USED .....
10. USE OF PAPER .....
11. PLACEMENT .....
12. STROKES: QUALITY .....
13. DENTAL EQUIPMENT .....
14. DEVELOPEMENTAL LEVEL .....

TOTAL PART A .....

PART B

Add 5 points for each

15. OMISSION: 1 PART .....
16. EXAGGERATION OF A PART .....
17. DEEMPHASIS OF A PART .....

Add 10 points for each

18. DISTORTION .....
19. OMISSION: 2 OR MORE PARTS .....
20. TRANSPARENCY .....
21. MIXED PROFILE .....
22. SHADING .....

TOTAL PART B .....

PART C

Circle the number which most clearly describes the Gestalt of the picture

1 2 3 4 5 6 7 8 9 10

TOTAL PART C .....

TOTAL SCORE A.....+ B.....+ C..... = ...

Fig. 1. CD:H scoring sheet.

Table 1. Sound Eye Motor (SEM) scale.

Score	Designation	Sounds	Eye	Motor
0	Comfort	No sound indicating pain	No eye signs of discomfort	Hands, relaxed, no apparent body tenseness
1	Mild discomfort	Nonspecific possible pain indication	Eyes wide show of concern, no tears	Hands show some tension
2	Moderately painful	Specific verbal complaint e.g., ow! Voice raised	Watery eyes	Random movement of arms/body grimace, twitch
3	Painful	Verbal complaint Indicates intense pain	Crying; tears running down the face	Movement of hands to make aggressive physical contact, pulling head away punching

rating on at least half of the measurement occasions, and the child was assigned an overall definitive positive rating if he received almost no negative scores[33]. This is also true for the SEM scale[29].

In order to determine the construct validity of the CD:H, SEM and Frankl scales were used as an objective assessment of the child's pain and distress during the treatment session by the operating dentist.

At the end of treatment session, the child was instructed to draw a picture of a person in a dental clinic. The child was asked to sit at a table of an appropriate height and was given a blank A4 sheet of paper and a box of twelve basic colour pencils. The sheet of paper was placed directly in front of the subjects at an angle which allowed the child to determine the direction of the paper alone. The box of colour pencils had to be opened exposing all of the available colours. The child was instructed: 'Please draw a picture of a person in a dental clinic. I will take your picture when you are finished'.

All of the subjects were asked if they liked to draw, and in case they were not eager,

they were excluded from the study. Children's Parents were with children during their drawings. However, the objective of the study was described for the parents and they were instructed not to influence the children to respond one way or the other.

The administrator observed the child to be sure that the child is able to attend to the task. In the event that the child was very distracted, the directions had to be repeated and encouragement to participate was given. If any questions were asked by the child, these questions would be responded to either with the original instructions or with clarifications that did not influence the child to respond one way or the other. The child was not prompted to add parts or colours to the drawing. No time limit was given. When the child indicated verbally or by gesture that his or her drawing was finished, the paper sheet and the colour pencils were collected. The drawing was labelled on the back side of the paper with the patient's number, the date of the test, birth date and gender.

The operating dentist (who was an experienced paediatric dentist and was the same for all patients) asked the child to draw and then collected the papers, but the scoring of the drawings was done by two investigators; a trained postgraduate student of paediatric dentistry and a psychologist (who were blind to how children behaved during dental treatment and their SEM and Frankl scales).

Scoring of the drawings

The internal validity for the drawing test has been proven in the Clathworthy's study[6,7]. The scoring method of this study was evolved from the CD:H Scoring Guide and Rating Scale and the CD:H score sheet. Raters were directed to read the CD:H manual and score the pictures. The scoring of the total tool is based on the theoretical foundations of drawing as a projective measure of children's state of anxiety.

According to the manual, the scoring of drawing is divided into three sections. Part A, contains 14 items: position, action, length, width, and size of person; eyes and facial expressions; colour predominance; numbers of colours used; use of the paper; placement on the paper; stroke quality; inclusion and size of dental equipment; and developmental level. Each item is scored on a scale of 1–10, with 1 indicating the lowest level of anxiety and 10 the highest. Part B consists of eight items consumed to be pathological indices. The omission, exaggeration, and de-emphasis of a body part receive five points. Distortion, omission of two or more body parts, transparency, mixed profile, and shading receive 10 points. If each of these items is not present, a score of 0 is recorded. Part C is a gestalt rating that calls for an overall response by the scorer to the child's anxiety as expressed in the picture on a 1–10 scale using the specific identifiers provided. A score of 1 indicates coping or low anxiety and a score of 10 indicates disturbance or high anxiety. The total score is determined by adding the totals of parts A, B and C[5]. The detailed rating scale for CD: H is described in Fig. 2. Level of anxiety based on the total score obtained from the CD:H score sheet were as follows[4]: ≤43: very low stress, 44–83: low stress, 84–129: average stress, 130–167: above average; and 168 and over: very high stress. Details for scoring each item described are found in CD:H manual[7].

Statistical analysis

For the assessment of inter-rater reliability of SEM and Frankl scales, the operating paediatric dentist and a second dentist (a trained postgraduate student of paediatric dentistry) independently assessed all children on both SEM and Frankl scales. The inter-rater reliability was 0.88 for SEM and 0.82 for Frankl scales. The intra-rater reliability was 0.91 for SEM and 0.89 for Frankl scales.

The scoring of drawings requires some judgment from the rater. For calculating inter-rater reliability, Spearman correlation accounted for the scores which were given by the two raters. The correlation between them was clearly demonstrated ($r = 0.83$). Using a random selection of 20 drawings in the study, they were rated again after 2 weeks by the raters, and reproducibility was assessed ($r = 0.80$, $r = 0.76$).

CHILD DRAWING: HOSPITAL (CD:H) RATING SCALE

Section A	1	2	3	4	5	6	7	8	9	10
1. Position of person	Standing - grounded	Standing - not grounded	Standing with crutches	Standing on bed	Sitting in chair	Sitting in bed	Sitting in bed, covered	Lying in bed	Lying in bed, covered	Floating or no person
2. Action -Life	Visibly moving		Person or picture lively		Shows some life		Potential for movement	No movement, but life		Rigid, no life
3. Length of person	Body tall, occupies whole paper	Tall body appropriate to picture	Short body appropriate to picture		Short people, bodies exposed		Very small, constricted people	Upper torso only	Head only, body covered	Floating head, no body
4. Width of person related to length	Width appropriate to length	Width slightly reduced compared to length	Width thin compared to length, clothed	Body thin. not clothed, or appropriate, but not clothed	Appropriate body size, covered	Stick figures with clothing	Stick figures, no clothing	Very thin body or stick figure, covered	Ambiguous body shapes	No body, floating head, no evidence of body under covers
5. Facial expression	Smile		1/2 smile		Neutral			1/2 Frown	Frown	No face, no expression
6. Eyes/pupils						Piercing	Pinpoint	Closed	Vacant, unseeing	No eyes
7. Size of person in comparison to environment	Appropriate size		Medium to small		Small			Very small		Tiny, overwhelmed
8. Color predominance	Yellow		Green		Blue	Orange	Purple	Brown	Red	Black
9. Number colors used	8	7	6		5	4	3		2	1
10. Use of paper	All		3/4		1/2			1/4		Restricted 1/8
11. Placement on paper										
12. Quality of strokes	Firm, dark		Dark, some light		Medium, equal light and dark			Light		Very light
13. Dental equipment	None included		Proportional in size		Slight increase in size			Larger equipment		Large and threatening
14. Developmental level	Above normal		Normal		Slightly below normal		Below normal			Markedly below normal

Modified from Clatworthy, 1999

Fig. 2. CD:H rating scale.

Data were also examined between three age groups: 4–6, >6–9, >9–11.

The rational for this age division corresponds to six major stages of artistic development based on Piaget's theory of cognitive development, during which a child moves from scribbling to creating realistic images on paper. Understanding the significance of these stages will help the practitioner gain insight into the process behind a child's artistic expression[17].

Following the calculation of mean and standard deviation for CD:H and the distribution of SEM and Frankl scales, *t*-tests for evaluating differences based on gender, ANOVA for determining age-group differences and Spearman's correlation coefficient for assessment of correlations between variables were used.

Ethical viewpoints

The study was ethically approved by the ethics committee of Tabriz University of Medical Sciences. The details of the study were explained to the parents and their written informed consents were taken. The children were asked if they liked to draw and most of them were eager to participate. Subjects who rejected to draw were excluded from the study.

Results

A total of 54 children (4–11 years of age with the mean age of 7.73 ± 1.93; 11 males (20.4%) and 43 females (79.6%)) participated in this study. Fifteen subjects (27.8%) had 4–6 years old, 24 (44.4%) were >6–9 years old and 15 (27.8%) were >9–11 years old. Fig. 3 shows the samples of children's drawings.

The minimum and maximum time spent for completing the drawings was 3 and 14 min, respectively.

SEM, Frankl, and CD:H scores

Mean CD:H score of subjects was 61.19 ± 5.99. The mean of CD:H scores for

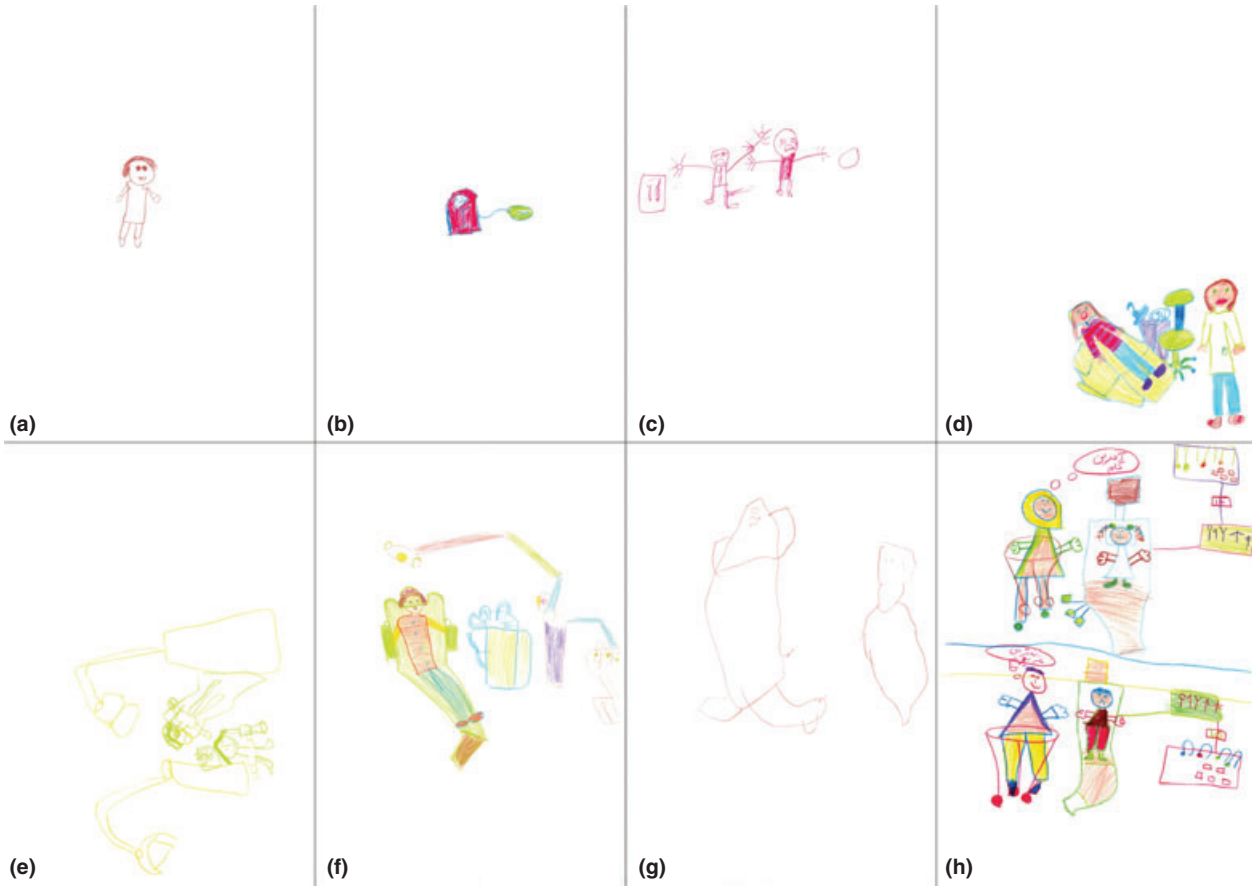


Fig. 3. Samples of children's drawings: The drawing of a 10-year-old girl with trauma to upper central incisors resulting in crown fracture. Exaggeration of the broken teeth is apparent (a). The drawing of a 7-year-old boy terribly scared with aggressive defensive behaviour (SEM = 3, Frankl = 1) depicting a lifeless person lying on a dental unit in a tiny stick form (b). The drawing of a 7-year-old girl with dental trauma, showing a crying scared kid and a frightening bizarre dentist (c). The drawing of an 8-year-old cooperative girl (d). The drawing of an 8-year-old girl with SEM score of 3 and Frankl score of 1, in which the dentist is holding a big syringe in his hand and laughing (e). The drawing of a 10-year-old girl depicting a girl with watery eyes holding the arms of the dental chair (f). The drawing of a 5-year-old girl with severe aggressive behaviour, pulling head away and shouting (SEM = 3), in which two distorted ghost-like creatures represent the kid and the dentist (g). The drawing of a 9-year-old girl, depicting a happy kid with a female dentist (upper) and a sad kid with a male dentist (lower) (h).

very low, low and average levels were 35.06 ± 4.35, 59.14 ± 11.74, and 98.00 ± 9.76, respectively. The distribution of SEM and Frankl scales and the frequency of SEM, Frankl, and CD:H scores according to age and gender are shown in Table 2.

Bivariate correlations

There was a significant positive direct linear correlation between SEM and CD:H scores ($P < 0.001$, correlation coefficient = +0.483) (Fig. 4). Moreover, a significant negative linear correlation was found between Frankl and CD:H scores ($P < 0.001$, correlation coefficient = −0.550) (Fig. 5). The correlation coefficient between SEM and Frankl scales was −0.905 (the rating system in Frankl is reverse to both SEM and CD:H scales).

Gender and age differences

There were no significant differences in the obtained scores between genders.

Data were examined between three age groups: 4–6 years old (15 subjects [27.8%]), >6–9 years old (24 subjects [44.4%]), and >9–11 years old (14 subjects [27.8%]). There were no significant differences between age groups in SEM and Frankl scales, but with

Table 2. Frequency of SEM, CD:H and Frankl scores in base of age groups and gender.

Variables	SEM scoring: Mode	SEM Classification: 0	1	2	3	CD:H scoring: Mean± SD	CD:H Classification: Very low	Low	Average	High	Very high	Frankl scoring: Mode	Frankl Classification: 1	2	3	4
Age groups																
4–6	3 (0–3)	1 (1.85%)	5 (9.25%)	6 (11.11%)	3 (5.55%)	75.13 ± 26.00 (31–123)	1 (1.85%)	7 (12.96%)	7 (12.96%)	–	–	1 (1–3)	3 (5.55%)	6 (11.11%)	6 (11.11%)	–
>6–9	2 (0–3)	5 (9.25%)	10 (18.51%)	4 (7.40%)	5 (9.25%)	60.92 ± 27.05 (27–106)	8 (14.81%)	10 (18.51%)	6 (11.11%)	–	–	2 (1–4)	6 (11.11%)	3 (5.55%)	14 (25.92%)	1 (1.85%)
>9–11	3 (0–3)	5 (9.25%)	8 (14.81%)	1 (1.85%)	1 (1.85%)	47.67 ± 16.58 (28–85)	9 (16.66%)	5 (9.25%)	1 (1.85%)	–	–	1 (1–3)	1 (1.85%)	1 (1.85%)	13 (24.07%)	–
Gender																
Male	1 (0–3)	2	5 (9.25%)	1 (1.85%)	3 (5.55%)	61.64 ± 28.79 (28–106)	5 (9.25%)	2 (3.70%)	4 (7.40%)	–	–	3 (1–3)	4 (7.40%)	–	7 (12.96%)	–
Female	1 (0–3)	9 (16.66%)	18	10 (18.51%)	6 (11.11%)	61.07 ± 25.59 (27–123)	13 (24.07%)	20 (37.03%)	10 (18.51%)	–	–	3 (1–4)	6 (11.11%)	10 (18.51%)	26 (48.14%)	1 6(1.85%)

SEM, Sound Eye Motor scale; CD:H, Child Drawing: Hospital scale; SD, standard deviation.

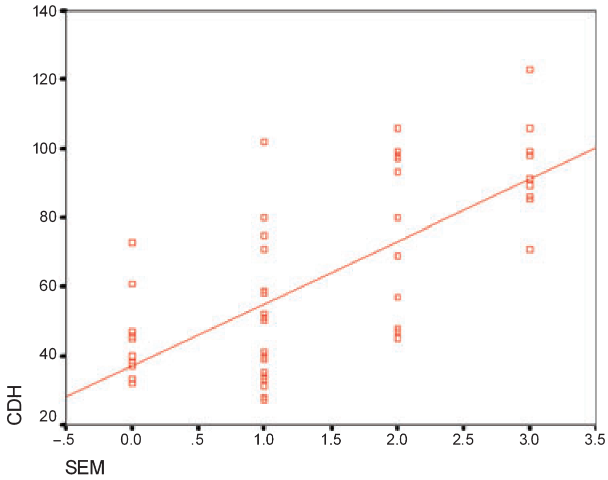


Fig. 4. Linear correlation between CD:H and SEM scores.

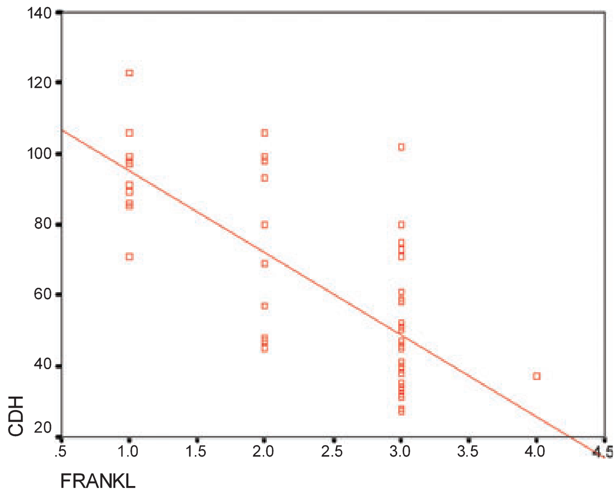


Fig. 5. Linear correlation between CD:H and Frankl scores. Note that the highest Frankl score corresponds to the lowest CD:H and SEM scores.

CD:H, a significant difference was seen between the first (4–6) age group and the third (>9–11) age group using Scheffe's test.

Discussion

The most important factor influencing children's cooperation during dental treatment is anxiety. A direct and applicable measure of anxiety could therefore, yield pertinent data on the complicated and partially invisible fears influencing the child patient[27].

According to the results of this study, it was revealed that drawing is highly correlated

with both standard SEM and Frankl scales for evaluating children's distress in dentistry. The high correlation coefficient between SEM and Frankl scales is a result of using almost the same core items for scoring in both scales. However, the SEM scale provides more detailed items for observation in daily clinical practice. For example, crying in the Frankl scale has been broken down into small parts regarding sound and eye indications in the SEM scale[30].

The findings of our investigation are in accordance with the result of Clatworthy *et al.*, who found children's drawing in hospital is a valuable assessment tool to measure the emotional status of hospitalized children[6]. Similarly, analysing children's drawings has also been proved to be a useful method in the diagnosis of headache types[24]. Moreover, in Sheskin's study, drawing has been shown to be a sensitive measure of the child's anxiety[27].

Because of the small sample size, which is the major limitation of our study, the robustness of our findings on gender and age subgroups in SEM and Frankl scale outcomes is limited, and we were unable to demonstrate any significant differences between the components of these outcomes. Therefore, the comparisons between subgroups may not be statistically valuable and further studies with larger sample sizes are needed to further investigate the differences between genders and age subgroups. However, despite the insufficient power of the study to allow for comparisons between subgroups, a statistically significant difference in the CD:H score of the 4–6 year-old subjects was noticed, which probably indicates an increased level of anxiety in the youngest age group evaluated. This finding is in accordance with that of Staffstorm's study in the diagnosis of headache types, in which false positives and false negatives from drawing analysis were actually lowest in the youngest age group[24]. In fact, for children of 4–6 years of age, drawing can facilitate discussions about traumatic experiences by providing a link between children's internal thoughts and their perceived reality[17], by which the young children seek to express themselves and their experiences[6,7]. Therefore, this potential difference may need to be further assessed in later studies with larger sample sizes. In contrast, in Clatworthy's study, there were no overall age differences in CD:H scores[6]. However, in a later attempt to determine the construct validity of the CD:H method within the control group, 5–8 year-old children demonstrated a significant increase in anxiety from admission to discharge compared with older children (9–12 year-old), but this did not occur in the experimental group[6].

It is important to note that children, especially younger age groups, may not always be able to express their exact feelings and anxiety verbally[6]. While some may exhibit behavioural indicators like aggression, others may not even express their anxiety in behaviour but suffer from great amount of stress internally. Younger children undergoing medical procedures exhibit more crying behaviours than do older children. A rationale for these findings is that physiological competency for expression of specific behaviours like crying or aggressive behaviour is tempered by cognitive interpretations of sociocultural appropriateness. For example, while children from birth through adolescence are physiologically capable of crying or screaming, these behaviours are not socially appreciated for school-age children and adolescents. Therefore, an older child or adolescent who feels like crying may suppress the behaviour because 'crying is for babies' and because of what his or her peers might think of such behaviour. Therefore, different tools are needed to account for developmental differences[34]. When children are interviewed, their responses may actually relate more to their ability to retrieve information than to their knowledge or understanding of an event or concept[35]. Giving children the opportunity to draw may moderate the retrieval process by generating retrieval clues that are internally generated and as a result, help children organize their narratives that, in turn, allow them a better opportunity to share their voice[15].

Projective techniques are effective tools for assessing a person's internal feelings, thoughts and, in some instances, their

anxiety. According to Poster, projective techniques used in clinical practice reflect certain aspects of a person's personality such as his or her attitudes, thoughts, and feelings. Poster stated that this process begins during infancy and continues throughout adulthood. Piotrowski *et al.* stated that projective techniques have proved valuable in the assessment of personality throughout the world, and because they are not language dependent, they may be clinically effective for children with different languages[16]. Hence, drawing can be considered a perfect natural method for self-expression.

It would be of interest further to note that in this study, except three children (5%) who rejected to draw (because they did not like to make a drawing at the moment), all the children had a great tendency to draw. Even those with the most aggressive behaviour in SEM and Frankl scales enjoyed to make a drawing. All parents were also satisfied with this procedure, and therefore, it was a pleasant task for both. Previous studies are in agreement with our study providing strong, definitive evidence for drawing as a natural mode of communication that children rarely resist[6–8,11,34].

We found some behavioural, psychological and cognitive parameters in children's drawings; for instance, children's facial expressions, crying, depiction of defensive behaviours (putting their hand on their mouth, grasping dental unit's arms, or attaching to the parents, and holding their hands), exaggerating dental equipment such as syringes, exaggerating the injured parts like broken teeth, illustrating the relationship between the child and the dentist, writing words explaining their comforts and discomforts or their thankfulness, shocked views, and lifeless or lively pictures of themselves. Therefore, children's drawings in dental settings can be used to gather a wide range of information.

It seems children can personally conclude how to show their feelings in a dental setting during drawing. This can be considered a self-report projective method, by which the children express their feelings in a pleasant, enjoyable and familiar way. This probably is the main advantage of using drawing over available objective and subjective methods. Objective methods in paediatric dentistry such as SEM and Frankl scales are based on the decision of the operator[13]. Subjective methods like pain thermometer or VAS need child's decision to be made in a short time, and there is a probability to random selecting because of the child's lower developmental level, which will not exactly present the child's emotional status. In addition, it is difficult to isolate a child's pain experience from other emotional states[9]. The use of emotionally laden anchor cue provokes a concern whether the scales measure pain or nonpainful state, or the emotional aspect of hurting or the non-nociceptive but distressing state of fear or anxiety that often accompanies painful experiences is reported[9]. The instructions that typically accompany scales with a smiling face as the 'no pain' anchor describe the faces as 'happy' or 'sad'. Children who are not in pain are not necessarily happy; therefore, there is a risk of 'false positive' pain in unhappy children who are not in pain. Similarly, paediatric pain researchers are concerned with 'false negatives', as scales with a smiling face as the 'no pain' anchor appear to confound the construct of 'feeling happy' with being 'pain-free'. Indeed, there have been reports of young children confusing 'hurting' with 'feeling'[8,9].

In contrast, while drawing, the child has the opportunity to decide what she/he is going to draw without any time limit. Therefore, drawing increases the amount of information children report about their experiences, and it may also help in organizing their narratives, allowing them to tell a better story[17]. The shortcomings of available instruments highlight the necessity of using new subjective methods which can distinguish between anxiety and pain.

There are a number of other advantages to drawing. As noted in numerous other studies, drawing can be easily used without any special training. It is not time-consuming for the clinician, and the equipment needed is easily accessible and not expensive[6,7,17]. In this study, some children considered drawing a reward and, in general, it was relieving for them.

As it was aimed in this study, analysing children's drawings, can be regarded a valid assessment tool in the children's level of distress in dental settings. The scoring system and the score sheet evolved from CD:H, used in this study, may need to be revised in future studies. The small sample size of this study has limited an accurate analysis of comparisons among age subgroups; and further studies with larger sample sizes are recommended.

Conclusion

Drawing is a useful measure of children's level of distress in paediatric dental settings in a way that is easier, familiar and more enjoyable for the child patient.

What this paper adds

- This paper suggests a new method to evaluate children's emotional status in paediatric dentistry, considering the fact that children can bring whatever they really feel to their drawings as their alternative language.
- Drawing can be a statistically valid indicator of child's emotional status compared to SEM and Frankl scales.
- This method is reliable enough to be recommended for all age groups.

Why this paper is important to paediatric dentists

- Assessment of children based on their behaviour and understanding their emotional status are very important skills for a paediatric dentist. Drawing can be a useful measure of children's emotional status and anxiety in paediatric dental settings in a way that is easier, familiar and more enjoyable for children.
- This method is easy to use, and the equipment needed is easily accessible and not expensive. Moreover, it can be easily used by nurses without any special training.
- Drawing may be a conjunctive therapeutic method to release stress in paediatric dentistry, pending more studies.

Acknowledgements

This study was supported and funded by Tabriz University of Medical Sciences, Tabriz, Iran. The authors appreciate the staff at the Department of Paediatric Dentistry for their assistance. Special thanks to Dr Chalabianlou and Dr Nezami for their kind help with the statistical analysis.

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