Expression of pain and distress in children during dental extractions through drawings as a projective measure: A clinical study

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Abstract
AIM: To evaluate the efficacy of drawings as a projective measure of pain and distress in children undergoing dental extractions.

METHODS: Children in the age range of 4-13 years with existence of untreatable caries or over-retained primary teeth, indicated for extractions were included. Pain was assessed using one behavioral [faces, legs, activity, cry and consolability (FLACC)] scale; and a self report measure; faces pain scale-revised (FPS-R), at two points of time, after completion of local anesthetic administration and after extraction. The general behavior of children was assessed with Wright’s modification of Frankl rating scale. At the end of the session, children were instructed to represent, themselves along with the dentist, and their experiences of the dental treatment through drawing. The drawings were scored utilizing Child drawing: Hospital scale (CD: H) manual and correlated with FLACC, FPS-R and Frankl using Pearson correlation test.

RESULTS: A positive correlation, though statistically not significant, was observed between CD: H scores and all other considered parameters (Frankl, FPS-R and FLACC) in the present study.

CONCLUSION: Drawings could not act as surrogate measure of child’s pain; however, they acted as a narrative of his/her experiences and reflection of inner
emotions. Hence, drawings can be used as an additional dental armamentarium.

Key words: Anxiety; Child; Distress; Drawings; Pain

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Core tip: Assessing the effect of an invasive dental treatment, such as, extractions, on children is very important. To achieve this, drawings can be addressed as a method for working with children. They act as narrative of children's painful experience and emotions.

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INTRODUCTION

Pain is an unpleasant combination of sensations and emotions, which is difficult to describe. As the threshold for the pain varies from person to person, only the person experiencing the pain can explain its intensity and nature. Child’s pain is complex and varies with his/her cognitive, emotional and social experience[1,2], necessitating an accurate assessment. Dentistry involves numerous procedures, which may be perceived as painful by a child; local anesthetic administrations and extractions being the most painful of all, which can cause psychological distress[3,4]. Hence, a multilevel approach of assessing the procedural pain in dentistry is essential, as neglecting their experience can lead to development of anxiety in the child, which becomes a major barrier in accepting dental treatment during their future visits[5]. Thus, correct appraisal of pain helps in understanding their interest in seeking treatment in the future, assessing their behavior in succeeding visits as well as customizing the guidance for the child.

Procedural pain can be assessed using behavioral [faces, legs, activity, cry, consolability (FLACC) scale/sound, eye, motor scale]6,7, self report measures [facial pain scale-revised (FPS-R)/pain thermometer/visual analogue scale/colour analogue scale/finger span test]8-12 and/or a combination of these approaches. However, depending on the child’s age and development, the ability of these measures to quantify and qualify the pain experience of a child varies13. Thus, communication with the child, in verbal/non-verbal/compounded means, plays a vital role in evaluating their pain. However, children may or may not have the ability and/or vocabulary to express their feelings, fears and concerns verbally14. Most of the children disguise the inner fears of their painful experience15, which becomes another drawback of verbal communication. Thus, there is a need to use some non-verbal technique that explores their inner emotional status and enhances the verbal communication. One such technique is the use of drawings, a pleasant exercise, which tends to project the things felt as important by a child16,17. Children’s drawing is thought to reflect his/her inner world; depicting various feelings and relating information concerning intelligence, psychological status and interpersonal style18-24. Thus, drawings ameliorate the communication capacity of the child and help in verbalizing their distress. Free drawings (child is free to draw anything without directions or instructions), bridge drawings (child is asked to draw about future expectations and relative threat), volcano drawings (child is asked to draw his/her means to manage anxiety), person picking an apple from a tree (to know the child’s coping ability and resourcefulness), kinetic family drawings (child asked about family dynamics), human figure drawings (asked to draw a picture of a person) are the various means employed in studies on children drawings, of which, human figure drawings are popular clinically25.

Scoring systems for drawings were also developed, of which Good enough-Harris test, Koppitz developmental scoring system, Draw-a-person quantitative scoring system are renowned26,27. To assess the emotional status of hospitalized school age children, Child drawing: Hospital (CD: H) manual was specially developed28,29. This manual was applied in pediatric dental settings to assess the effect of pulp therapy and/or restorative treatments for carious primary molars30. The present study was performed to determine the efficacy of drawings using CD: H manual in depicting the experiences of children undergoing local anesthetic (LA) administrations and extractions of primary teeth.

MATERIALS AND METHODS

The study was performed in Narayana Dental College and Hospital, Nellore, India during the period July 2012 to June 2014.

Sample

After obtaining institutional ethical clearance (as per Code of Ethics of the World Medical Association and Declaration of Helsinki, 1964, as revised in 2004), children who met all inclusion criteria were selected: (1) age range of 4 to 13 years (irrespective of gender and ethnic characteristics); (2) existence of untreated carious or over-retained primary teeth, indicated for extraction; (3) complete physical and mental health without any confounding medical history; (4) interested in drawings; and (5) whose parents gave their consent to participate in the study.

Children indicated for extraction of teeth as a part of emergency/immediate phase treatment, those with very negative behavior21 during initial examination and who were reluctant to draw picture were excluded.

About CD: H scale

CD: H scale was employed in the present study, as it
is a proven instrument with good internal validity[28]
developed as a means of measuring the emotional
status of hospitalized school aged children based on
the theoretical foundation of drawings as a projective
measure of children’s state of anxiety. This manual
consists of three parts, A, B and C. Part A focuses
on the facets such as position, action, length, width,
size of the child, his/her eyes and facial expression,
colour predominance, number of colors used, use and
placement on paper; stroke quality, inclusion and size
d of dental equipment and developmental level of the
child as projected from their drawings. Part B focuses
on omission, exaggeration, de-emphasis and distortion
of body parts along with transparency and shading,
whereas, part C represents general gestalt of the picture.
The levels of anxiety, based on the scores obtained
from CD: H scores are, ≤ 43: Very low stress, 44-83:
Low stress, 84-129: Average stress, 130-167: Above
average; and 168 and over: Very high stress; the
detailed description of which can be read from CD: H
manual[29].

CD: H scores obtained in the present study were
 correlated with FLACC, FPS-R scores and behavior of
the children as assessed with Frankl’s behavior rating
scale. FLACC scale was considered due to its simplicity
of application in clinical settings, that consists of five
behavioral categories, facial expression, leg movement,
bodily activity, cry or verbalization, and consolability[32],
each rated on a scale of 0 to 2 to provide a maximum
overall pain score of 10, an acceptable ordinal convention
point. Its validity was also proved in children, adults
with cognitive impairment, and critically ill adults[33-35].
To achieve, self report of pain possible on the widely
accepted 0 to 10 metric, FPS-R, adapted from the Faces
pain scale was employed[8,36]. This was considered in the
study due to the ease of administration and absence
of smiles and tears in the faces, which is an added
advantage[36].

Interventions
LA was administered for all the recruited children and
extraction of the intended tooth performed following
a standard protocol with routine behavior guidance
techniques consistently by all the operators (two male
and two female pediatric dentists) which was videotaped.
The behavior of the child during oral examination,
intraoral radiography, topical anaesthetic application, LA
administration, extraction and departure from dental
chair was rated using Wright’s modification of Frankl
rating scale. The overall score was obtained by summing
the ratings on all the above mentioned occasions; if the
child was positive on at least half of the situations, he/
she was designated as definitely positive (+). If there was no negative score in any of the
occasion, the child was designated as definitely positive
(++). As a behavioral measure of pain and distress,
FLACC scale[27] was used to score the LA administration and extraction procedures separately. FPS-R[41], a self-
report measure, was also recorded at two points of
time, after completion of LA administration and after
extraction. All the above scorings were recorded by two
investigators who were not involved in the treatment
procedure (RK and SP).

At the end of the therapeutic session, one of the
investigators (SP) seated each child in a position where
they can observe the complete clinical area. The A4
sheet paper and crayons box (exposing all the colours)
were placed on the table in front of children. They were
instructed to represent, by drawing, themselves along
with the dentist and their experience of the dental
treatment; while drawing neither parent/s nor dentist
guided the children. If the children were not eager to
draw at that point of time, they were excluded from the
study. No time limit was given and children were
informed that they can stop drawing whenever they
want to. If the children were very distracted, the above
directions were repeated. After completion of drawing,
the details of the children (including outpatient number,
date of birth and gender) were noted on the back of
the drawing paper, whereas, explanations for the
drawing were noted on separate paper. The drawings
were analyzed by one Pediatric dentist (SN) and a
clinical psychologist (who was blinded to the behavior
of children in clinic) separately based on the manual. Any
disagreements between the two were discussed and
crosschecked with explanations given by the children;
and after getting common consensus, final scores for
drawings were given.

Sample size determination
Based on the findings of a previous study conducted
with sample size of 54, which compared drawing scores,
applying CD: H manual, with behavioral measure of
pain; and considering the findings of our pilot study on
10 children with behavioral measure as the primary
outcome, and self report measure and behavioral ratings
as secondary outcomes, with the level of significance set
at 0.05, power of 80%, a minimal sample size of 100
was determined.

Statistical analysis
Cohen’s kappa was employed to measure the reliability
of the obtained data (both inter-rater and intra-rater).
Inter-rater reliability between two investigators (SP and
RK) for FLACC and Frankl scores were 0.91 and 0.89
respectively. Intra-rater reliability for FLACC and Frankl
(scored after two weeks on the basis of videotaped
treatment procedure) were 0.96 and 0.90. The drawings
of these children were scored once by both the Pediatric
dentist (SN) and a clinical psychologist and reproducibility
of CD: H scores were found to be r = 0.85, r = 0.88.

The data was assessed for the difference in distribution of
participants based on age, gender and influence of
accompanying person using $\chi^2$ test; the differences
between/among the variables in various groups was
evaluated using one way ANOVA followed by post hoc
comparisons. The correlation between the variables
(bivariate correlation) was assessed with Pearson
accompanying person. Thus, 7 participants (6.5%) were 4-6 years old, 33 (30.8%) were > 6-13 years and 67 (62.6%) were > 9-13 years old; 58 participants (54.2%) were boys and 49 (45.8%) were girls; 55 (51.4%) children were accompanied by mother, 31 (29%) and 21 (19.6%) by father and guardian respectively. The distribution of participants in various scoring categories of Frankl, FLACC, FPS-R and CD: H scores based on age, gender and accompanying person are presented in Tables 1 and 2. Significant differences were not observed with the distribution of participants in various categories of CD: H, FPS-R and Frankl. However, there was a statistically significant difference in the distribution of participants based on FLACC scores among various age groups (P < 0.01 during LA administration and extractions) (Table 2).

Differences in distribution of participants
The sample was grouped based on the age, gender and accompanying person. Thus, 7 participants (6.5%) were 4-6 years old, 33 (30.8%) were > 6-13 years and 67 (62.6%) were > 9-13 years old; 58 participants (54.2%) were boys and 49 (45.8%) were girls; 55 (51.4%) children were accompanied by mother, 31 (29%) and 21 (19.6%) by father and guardian respectively. The distribution of participants in various scoring categories of Frankl, FLACC, FPS-R and CD: H scores based on age, gender and accompanying person are presented in Tables 1 and 2. Significant differences were not observed with the distribution of participants in various categories of CD: H, FPS-R and Frankl. However, there was a statistically significant difference in the distribution of participants based on FLACC scores among various age groups (P < 0.01 during LA administration and extractions) (Table 2).

Differences based on age, gender and influence of accompanying person
The differences between/among scores recorded in groups divided based on age, gender and accompanying person.

**RESULTS**

A total of 107 children (58 boys and 49 girls) completed the study, out of the 110 participants. Three children willingly participated at the beginning of the study, but, after extraction dissented to draw. The mean age of the children who completed the study was 10.1 years (range: 4-13). The mode for the Frankl score of participants was 4 (range: 2-4). The mean FLACC score during LA administration was 2.8 ± 2.7 (range: 0-10) and during extractions it was 2.24±2.04 (range: 0-10). The mode for FPS-R after LA administration was 2 (range: 0-10) and after extraction it was 0 (range 0-10). The mean CD: H score of participants was 74.1 ± 16.2 (range of 36-112). Some samples of children’s drawings are presented in Figure 1.

**Figure 1** Samples of children’s drawings. A: Ages 11 years; gender: boy; Franki: 4. FLACC score (LA): 2 (mild discomfort), FLACC score (Ext): 2 (mild discomfort); FPS-R score (LA): 6, FPS-R score (Ext): 8. Child drawing: Hospital score: 94 (average stress). The predominant colour in the drawing was black. The child included dental equipment in the drawing (syringe and dental chair) represented himself crying in the dental chair. B: Ages 12 years; gender: boy; Franki: 4. FLACC score (LA): 4 (moderate pain), FLACC score (Ext): 6 (moderate pain); FPS-R score (LA): 8, FPS-R score (Ext): 8. Child drawing: Hospital score: 67 (low stress). The child used only black colour and included dental equipment in the drawing including cabin partitions. C: Ages 13 years; gender: boy; Franki: 4. FLACC score (LA): 2 (mild discomfort), FLACC score (Ext): 1 (mild discomfort); FPS-R score (LA): 8, FPS-R score (Ext): 0. Child drawing: Hospital score: 92 (low stress). The child used only black colour and included dental equipment. It was an action picture showing extraction of his tooth by the doctor. Child omitted noses, ears and hair for himself. D: Ages 11 years; gender: boy; Franki: 3. FLACC score (LA): 3 (mild discomfort), FLACC score (Ext): 0 (mild discomfort); FPS-R score (LA): 2, FPS-R score (Ext): 0 (mild discomfort). E: Ages 12 years; gender: boy; Franki: 4. FLACC score (LA): 2 (mild discomfort), FLACC score (Ext): 0 (mild discomfort); FPS-R score (LA): 2. FPS-R score (Ext): 6. Child drawing: Hospital score: 49 (low stress). Child drew an action picture if he is undergoing extraction and also included dental equipment (Try with instruments arranged on it). Note that the noses and ears are missing in his human figures. F: Ages 10 years; gender: boy; Franki: 4. FLACC score (LA): 5 (mild discomfort), FLACC score (Ext): 0 (mild discomfort); FPS-R score (LA): 2, FPS-R score (Ext): 0. Child drawing: Hospital score: 64 (low stress). Child drew himself in a very happy mood, although he included dental equipment (extraction instrument and LA spray). FLACC: Faces, legs, activity, cry, consolability scale; FPS-R: Facial pain scale-revised; LA: Local anaesthetic administration; Ext: Extractions.
person, were analyzed, and significant differences were not observed based on age and accompanying person in CD: H, FPS-R or Frankl scores. However, there was a statistically significant difference in CD: H scores between boys and girls (Table 3) and in the FLACC scores recorded among the age groups, during LA administration (post hoc showing difference between > 6-9 and > 9-13 age groups) as well as extractions (post hoc showing difference between > 6-9 and > 9-13 and 4-6 and > 9-13 age groups). Significant difference was also observed in FLACC values recorded during extractions among the groups divided based on the accompanying person (post hoc showing difference between the group of children, accompanied by mother and those by father as well as between the groups accompanied by father and guardian) (Table 4).

### Correlations
There was a positive correlation between CD: H scores and all the other considered parameters (Frankl, FPS-R...
and FLACC) which was not statistically significant. However, there were some statistically significant positive correlations, as well as some non-significant negative correlations between CD: H and other parameters based on age, gender and accompanying person which are represented in Table 5. In children belonging to 4-6 year age group, FPS-R and FLACC during LA administration were significant and correlating positively with CD: H scores, whereas others were not. In > 6-9 and > 9-13 year age groups, there were non-significant associations between CD: H scores and all other considered parameters. In the data segregated based on the gender, there were no statistically significant correlations between the CD: H scores and other parameters. The data segregated based on accompanying person also showed non-significant associations, except FLACC scores, during extraction in children accompanied by mother and FPS-R during LA administration in children accompanied by guardian, showing significant positive correlations.

**DISCUSSION**

Drawing ability in children shows predictable, observable and measurable stages that coincide with cognitive and motor development; better representational and detailed with age. By the age of 4 years, children drawings emerge to have identifiable human figures and by the end of 13 years they reach a stage where drawings tend to become more natural, with true representation of things. As CD: H is a manual based on human figure drawings (HFDS), in the present study, children in the age range of 4 to 13 years were included. The data was also segregated for analysis into 4-6, > 6-9 and > 9-13 based on the development of the quality and content of HFDS.[16] Scoring systems also exist in human drawing tests, such as Good enough-Harris, Koppitz developmental system and Draw-a-person quantitative system, however, CD: H was employed in the present study, as it is exclusively developed for assessing the emotional status of hospitalized children.

Before discussing the correlations, the distribution of participants as observed in the present study needs attention, as it revealed fluctuations on the observational scale. Significant differences were observed in FLACC scores among the three age groups considered. In > 9-13 year age group, all the children during LA administrations and majority of the children during extractions, scored 0 in FLACC. The mean scores were also less in > 9-13 year age group, for the differences among the scores recorded. These observations are in accordance with the reported drawback of FLACC, *i.e.*, older children tend to mask the expression of pain.[38-42] Another observation in the present study was; the mean FLACC scores were statistically less significant in children accompanied by father, compared to those accompanied by mother/guardian, which can be due to the authoritative nature of father in the culture of the study population that might have influenced the externalization of pain by the children accompanied by their father.

Correlations of CD: H scores with FPS-R, FLACC and

| Variables | Groups | Mean ± SD | One way ANOVA P value | Post hoc comparisons | Post hoc P value |
|-----------|--------|-----------|------------------------|---------------------|------------------|
| CD: H | Age groups (4-6, > 6-9, > 9-13) | 4-6: 76.4 ± 16.1 | 0.61<sup>1</sup> | 4-6 vs > 6-9 | 1.00<sup>NS</sup> |
| | | > 6-9: 76.1 ± 15.4 | | > 6-9 vs > 9-13 | 0.66<sup>NS</sup> |
| | | > 9-13: 72.9 ± 16.7 | | > 4-6 vs > 9-13 | 0.86<sup>NS</sup> |
| Gender (boys and girls) | Boys: 78.0 ± 15.3 | 0.01<sup>1</sup> | -- | -- |
| | Girls: 69.4 ± 16.2 | | | |
| Accompanying person (mother, father, guardian) | Mother: 72.6 ± 15.6 | 0.36<sup>NS</sup> | Mother vs father | 0.38<sup>NS</sup> |
| | Father: 77.6 ± 17 | | Mother vs guardian | 1.00<sup>NS</sup> |
| | Guardian: 72.9 ± 16.4 | | Father vs guardian | 0.59<sup>NS</sup> |
| FPS-R (LA) | Age groups (4-6, > 6-9, > 9-13) | 4-6: 6.0 ± 4.0 | 0.07<sup>NS</sup> | 4-6 vs > 6-9 | 0.92<sup>NS</sup> |
| | | > 6-9: 5.5 ± 3.8 | | > 6-9 vs > 9-13 | 0.14<sup>NS</sup> |
| | | > 9-13: 4.1 ± 2.9 | | 4-6 vs > 9-13 | 0.33<sup>NS</sup> |
| Gender (boys and girls) | Boys: 5.0 ± 3.5 | 0.24<sup>NS</sup> | -- | -- |
| | Girls: 4.2 ± 3.1 | | | |
| Accompanying person (mother, father, guardian) | Mother: 4.8 ± 3.9 | 0.63<sup>NS</sup> | Mother vs father | 0.64<sup>NS</sup> |
| | Father: 4.1 ± 3.3 | | Mother vs guardian | 1.00<sup>NS</sup> |
| | Guardian: 4.8 ± 3.6 | | Father vs guardian | 0.80<sup>NS</sup> |
| FPS-R (Ext) | Age groups (4-6, > 6-9, > 9-13) | 4-6: 6.0 ± 4.3 | 0.28<sup>NS</sup> | 4-6 vs > 6-9 | 0.78<sup>NS</sup> |
| | | > 6-9: 4.9 ± 3.9 | | > 6-9 vs > 9-13 | 0.34<sup>NS</sup> |
| | | > 9-13: 4.0 ± 3.5 | | 4-6 vs > 9-13 | 0.41<sup>NS</sup> |
| Gender (boys and girls) | Boys: 4.7 ± 3.8 | 0.50<sup>NS</sup> | -- | -- |
| | Girls: 4.2 ± 3.6 | | | |
| Accompanying person (mother, father, guardian) | Mother: 5.0 ± 3.9 | 0.06<sup>NS</sup> | Mother vs father | 0.08<sup>NS</sup> |
| | Father: 3.1 ± 3.3 | | Mother vs guardian | 1.00<sup>NS</sup> |
| | Guardian: 5.0 ± 3.4 | | Father vs guardian | 0.70<sup>NS</sup> |

<sup>1</sup>Significant at 0.01 level. CD: H: Children drawing: Hospital scale; FPS-R: Facial pain scale-revised; L.A: Local anaesthetic administration; Ext: Extractions; NS: Not significant.
Frankl revealed interesting findings. Considering the total sample, CD: H was positively correlating with all the other parameters though not significant statistically. These findings are in accordance with a previous study, which proved drawings as a projective measure for children’s distress in pediatric dentistry[30]. However, these correlations showed variations when the sample was segregated in the present study. In the age specific groups, we found significant positive correlation of CD: H with FPS-R and FLACC for LA administration was observed in 4-6 year group, and non-significant relations in older age groups. This can be due to curtailment of emotions on the dental chair by these older children, as well as drawing activity, considered as unrelated to...

### Table 4 Differences between/among scores (faces, leg, activity, cry, consolability scale and frankl) in groups divided based on age, gender and accompanying person

| Variables | Groups | Mean ± SD | One way ANOVA F value | Post hoc comparisons | Post hoc P value |
|-----------|--------|-----------|-----------------------|---------------------|-----------------|
| FLACC (LA) | Age groups (4-6, > 6-9, > 9-13) | 4-6: 3.9 ± 1.9 | < 0.01<sup>1</sup> | 4-6 vs > 6-9 0.97<sup>0.00</sup> | |
| | | > 6-9: 3.7 ± 2.2 | | > 6-9 vs > 9-13 < 0.01<sup>2</sup> | |
| | | > 9-13: 2.3 ± 1.2 | | 4-6 vs > 9-13 0.06<sup>0.00</sup> | |
| | Gender (boys and girls) | Boys: 2.9 ± 1.8 | 0.61<sup>0.00</sup> | -- | -- |
| | | Girls: 2.6 ± 1.6 | | | |
| | Accompanying person (mother, father, guardian) | Mother: 3.0 ± 1.6 | 0.60<sup>0.00</sup> | Mother vs father 0.63<sup>0.00</sup> | |
| | | Father: 2.6 ± 1.8 | | Mother vs guardian 1.0<sup>0.00</sup> | |
| | | Guardian: 3.0 ± 1.9 | | Father vs guardian 0.73<sup>0.00</sup> | |
| FLACC (Ext) | Age groups (4-6, > 6-9, > 9-13) | 4-6: 3.9 ± 2.8 | < 0.01<sup>1</sup> | 4-6 vs > 6-9 0.67<sup>0.00</sup> | |
| | | > 6-9: 3.2 ± 2.4 | | > 6-9 vs > 9-13 < 0.01<sup>2</sup> | |
| | | > 9-13: 1.6 ± 1.5 | | 4-6 vs > 9-13 0.01<sup>2</sup> | |
| | Gender (boys and girls) | Boys: 2.3 ± 2.2 | 0.93<sup>0.00</sup> | -- | -- |
| | | Girls: 2.2 ± 1.9 | | | |
| | Accompanying person (mother, father, guardian) | Mother: 2.5 ± 1.9 | < 0.01<sup>1</sup> | Mother vs father 0.02<sup>1</sup> | |
| | | Father: 1.3 ± 1.5 | | Father vs guardian 0.62<sup>0.00</sup> | |
| | | Guardian: 3.0 ± 2.4 | | Father vs guardian 0.01<sup>2</sup> | |
| Frankl (total) | Age groups (4-6, > 6-9, > 9-13) | 4-6: 3.4 ± 0.7 | 0.68<sup>0.00</sup> | 4-6 vs > 6-9 0.86<sup>0.00</sup> | |
| | | > 6-9: 3.6 ± 0.7 | | > 6-9 vs > 9-13 0.69<sup>0.00</sup> | |
| | | > 9-13: 3.7 ± 0.7 | | 4-6 vs > 9-13 0.94<sup>0.00</sup> | |
| | Gender (boys and girls) | Boys: 3.7 ± 0.6 | 0.17<sup>0.00</sup> | -- | -- |
| | | Girls: 3.5 ± 0.8 | | | |
| | Accompanying person (mother, father, guardian) | Mother: 3.6 ± 0.7 | 0.17<sup>0.00</sup> | Mother vs father 0.32<sup>0.00</sup> | |
| | | Father: 3.8 ± 0.5 | | Mother vs guardian 0.82<sup>0.00</sup> | |
| | | Guardian: 3.5 ± 0.7 | | Father vs guardian 0.52<sup>0.00</sup> | |

<sup>1</sup>Significant at 0.05 level; <sup>2</sup>Significant at 0.01 level. FLACC: Faces, leg, activity, cry, consolability scale; LA: Local anaesthetic administration; Ext: Extractions; NS: Not significant.

### Table 5 Correlation of Children drawing: Hospital Scale with facial pain scale-revised, faces, leg, activity, cry, consolability scale and frankl

| Variables | Groups | Correlation | CD:H | FPS-R (LA) | FPS-R (Ext) | FLACC (LA) | FLACC (Ext) | Frankl (Total) |
|-----------|--------|-------------|------|-----------|-------------|------------|-------------|---------------|
| Age | 4-6 | Correlation | 1 | 0.87 | -0.17 | 0.84 | 0.71 | -0.14 |
| | > 6-9 | Correlation | 1 | -0.19 | 0.72<sup>0.00</sup> | 0.02<sup>0.00</sup> | 0.07<sup>0.00</sup> | 0.76<sup>0.00</sup> |
| | > 9-13 | Correlation | 1 | 0.63<sup>0.00</sup> | 0.19<sup>0.00</sup> | 0.26<sup>0.00</sup> | 0.50<sup>0.00</sup> | 0.63<sup>0.00</sup> |
| Gender | Boys | Correlation | 1 | 0.11 | -0.12 | 0.12 | 0.09 | 0.01 |
| | | Significance | - | 0.40<sup>0.00</sup> | 0.37<sup>0.00</sup> | 0.38<sup>0.00</sup> | 0.52<sup>0.00</sup> | 0.94<sup>0.00</sup> |
| | Girls | Correlation | 1 | 0.18 | 0.18 | 0.11 | 0.07 | 0.15 |
| | | Significance | - | 0.22<sup>0.00</sup> | 0.21<sup>0.00</sup> | 0.46<sup>0.00</sup> | 0.65<sup>0.00</sup> | 0.32<sup>0.00</sup> |
| Accompanying person | Mother | Correlation | 1 | 0.18 | 0.10 | 0.19 | 0.28 | 0.01 |
| | | Significance | - | 0.20<sup>0.00</sup> | 0.47<sup>0.00</sup> | 0.17<sup>0.00</sup> | 0.04<sup>0.00</sup> | 0.98<sup>0.00</sup> |
| | Father | Correlation | 1 | -0.06 | -0.01 | 0.02 | 0.08 | 0.1 |
| | | Significance | - | 0.74<sup>0.00</sup> | 0.97<sup>0.00</sup> | 0.93<sup>0.00</sup> | 0.68<sup>0.00</sup> | 0.66<sup>0.00</sup> |
| | Guardian | Correlation | 1 | 0.55 | 0.11 | 0.20 | -0.12 | 0.33 |
| | | Significance | - | 0.01<sup>0.00</sup> | 0.65<sup>0.00</sup> | 0.38<sup>0.00</sup> | 0.61<sup>0.00</sup> | 0.14<sup>0.00</sup> |
| Total | Correlation | 1 | 0.17 | 0.04 | 0.12 | 0.08 | 0.12 |
| | Significance | - | 0.09<sup>0.00</sup> | 0.72<sup>0.00</sup> | 0.21<sup>0.00</sup> | 0.44<sup>0.00</sup> | 0.24<sup>0.00</sup> |

<sup>1</sup>Significant at 0.05 level; <sup>2</sup>Significant at 0.01 level. NS: Not significant; CD: H: Children drawing: Hospital Scale; FPS-R: Facial pain scale-revised; FLACC: Faces, leg, activity, cry, consolability scale; LA: Local anaesthetic administration; Ext: Extractions.
dentistry by them, might have lead to disparity in CD: H and FLACC/FPS-R scores. In the accompanying person category, a significant positive correlation of drawing scores with FPS-R for LA administration were observed in the guardian group; liberty to choose their expression of pain in the self-report scale by those children, who were not accompanied by parents can be a possible explanation for this. Significant positive correlation was also observed between CD: H and FLACC during extractions, in the children accompanied by mother. This can be due to free expression of pain physically, when accompanied by mother.

Gender difference in anxiety of children was reported frequently in the existing literature; some reporting high anxiety scores in girls[40,43,46], where as others depicting no difference[43]; In the present study we attempted to assess the gender difference in expression of pain, using self report, observational measures and in the drawings. Significant differences were observed in CD: H scores, with boys reporting high mean scores, compared to girls. All the remaining parameters, like FLACC and FPS-R, the mean scores were higher in boys, compared to girls, which can be due to the tolerance capacity of girls being more, compared to boys[45].

Scoring of drawings using CD: H was practically easy, but, this manual was originally developed to determine the effect of hospitalization on children[29]. When the same instrument was employed for assessment of dental treatments, some of the items in the scoring system were not applicable to dental settings; necessitating revision and simplification of this instrument. In part A; the first item position of the child, needs modifications, most of the proposed positions were not suitable for drawings in the dental operatory. The scoring of items; action, length and width of the person, considered in the CD: H, might have been subjected to bias because, the differences noted might be due to drawing abilities of children, rather than pain and anxiety. Other controversial aspects found in the present study were the color predominance and stroke quality. As children were provided with only crayons, almost all the children used black crayon as replacement for pencil to draw the outline of their drawings, which became the predominant color most of the times. Difficulty in scoring the quality of strokes, which were drawn with crayons, is a point to ponder. In part B, transparency, exaggeration and de-emphasis items can be eliminated as they do not adapt well to our dental scenario. Finally, the part C is prone for subjective variations, thus, omitting that part can lead to simplification of the instrument.

An attempt was made to observe drawings of children and their FLACC as well as FPS-R scores at an individual level which disclosed the utility of the present study. Some of the children with low scores on both FLACC and FPS-R drew dental equipment in their drawings and represented themselves in either helpless condition or crying in the dental chair. On the other hand, children who scored high values in FLACC and FPS-R, scored low in CD: H and presented themselves in happy mood. This clearly projects the major difference between drawings and other parameters; as, observational and self report measures represent fleeting emotions when the child is on dental chair, whereas, drawings symbolize the lasting feelings of a dental treatment. These enduring emotions are crucial for customizing our guidance techniques in future visits and for assimilating dental interest in children. This study, thus, has been proved as a means to discern the inner emotional disturbances originated in a child due to a painful dental treatment, and the way this can be used to guide the behaviour of the child in his/her future dental treatments. Drawings in the field of pediatric dentistry can be furthered studied by testing their validity in assessing the emotional condition of the child before treatment and depicting his/her subjective fears in their first dental visit.

The LA administration and extractions in the present study were performed by more than one pediatric dentist. However, this will not bias the results of the present study, as it is a factor that has a consistent influence on all the parameters considered to measure pain of a single child. The major limitation of the present study was disregarding the effect of schooling and intelligence, which are proposed to influence the drawings of children[19,26,27,46]. However, we substantiate our study, with the studies that proved no effect of these factors on drawing talent of children[18,47,49].

In conclusion, the present study clearly demonstrated that, scoring of children's drawing using CD: H manual, though authentic, has limited validity to measure the pain experience of children undergoing local anesthetic administration and extraction of primary teeth. Drawings could not act as surrogate measure of pain; however, we should not conclude an end to the use of drawings in a dental setting, as they act as narrative of children's painful experience and emotions. They are an easy, interesting exercise for children that can be employed as an additional measure of understanding the exact source of anxiety and/or to know the objective fears created due to a painful experience. Drawings address a method for working with children, and we should never underestimate the effect of our behavior and responsiveness on children. The most affirmative point in the present study was, the children after experiencing a stressful activity, got distracted due to the drawing and were leaving the dental operatory with a happy mood.

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COMMENTS

Background

During day to day pediatric dental practice, communication with children is significant, to assess the procedural pain and its impact on them. Non-verbal communication can explore the inner emotional condition, compared to verbal, as children may or may not have the ability and/or vocabulary to express their feelings, fears and concerns verbally. Drawings, being a pleasant exercise for children, have been considered as a measure to determine the pain and
distress in children undergoing dental extractions.

Innovations and breakthroughs
In pediatric settings, this is the second study in literature that determined the procedural pain experienced by children during dental treatments, first being the study done by Aminabadi et al in 2011. Aminabadi et al have tested the procedural pain during pulp therapy and/or restorative treatments for various primary molars. However, in dentistry, out of the numerous procedures perceived as painful by a child, local anesthetic (LA) administrations and extractions are the most painful of all, which can cause psychological distress. Hence, the present study is a breakthrough to know the efficacy of drawings in depicting the experiences of children undergoing LA administration and extraction of primary teeth.

Applications
Drawings acted as a narrative of children’s painful experience and emotions. They were an easy, interesting exercise for children and hence, can be employed as an additional measure of understanding the exact source of anxiety and/or to know the objective fears created due to a painful experience. Drawings addressed a method for working with children; after experiencing pain, they got distracted due to the drawing exercise and left the dental operatory with a happy mood.

Terminology
Pain drawings: Pain drawings are simple line drawings of the human figure on which patients can indicate their pain for both clinical information and research. Anxiety: Anxiety is a personality trait and is an apprehension, tension or uneasiness that stems from anticipation of danger, the source of which is largely unknown or unrecognized. Objective: Objective is defined as: it is acquired objectively or produced by direct physical stimulation of the sense organs, but not of parental origin, which are disagreeable and unpleasant in nature.

Peer-review
The work stresses on the relevance of non-pharmaceutical efforts to relieve children’s pain in medical procedures, as well as, presents an interesting and helpful methodology that should also be made available to others.

REFERENCES

1 Jerrett MD. Children and their pain experience. Child Health Care 1985; 14: 83-89 [DOI: 10.1207/s15326888chc1402_3]
2 Uman LS, Binkie KA, Noel M, Parkar JA, Chambers CT, McGrath PJ, Kisely SR. Psychological interventions for needle-related procedural pain and distress in children and adolescents. Cochrane Database Syst Rev 2013; 10: CD005179 [PMID: 24108531 DOI: 10.1002/14651858.pub3]
3 Klingberg G, Berggren U, Norén JG. Dental fear in an urban Swedish child population: prevalence and concomitant factors. Community Dent Health 1994; 11: 208-214 [PMID: 7850639]
4 Vika M, Skaret E, Raadal M, Ost LG, Kvåle G. Fear of blood, injury, and injections, and its relationship to dental anxiety and probability of avoiding dental treatment among 18-year-olds in Norway. Int J Paediatr Dent 2008; 18: 163-169 [PMID: 18328048 DOI: 10.1111/j.1365-263X.2007.00940.x]
5 Splith CH, Bängär B, Pine C. Barriers for dental treatment of primary teeth in East and West Germany. Int J Paediatr Dent 2009; 19: 84-90 [PMID: 19207736 DOI: 10.1111/j.1365-263X.2008.00949.x]
6 Bahl FE, Crellin D, Cheng J, Sullivan TP, O’Sullivan R, Hutchinson A. The use of the faces, legs, activity, and consolability scale to assess procedural pain and distress in young children. Pediatr Emerg Care 2012; 28: 1281-1296 [PMID: 23187981 DOI: 10.1097/PEC.0b013e318276d766]
7 Wu SJ, Julliard K. Children’s preference of benzocaine gel versus the lidocaine patch. Pediatr Dent 2003; 25: 401-405 [PMID: 13678108]
8 Hicks CL, von Baeyer CL, Spafford PA, van Korlaar I, Goodenough B. The Faces Pain Scale-Revised: toward a common metric in pediatric pain measurement. Pain 2001; 93: 173-183 [PMID: 11427329 DOI: 10.1016/s0304-3959(01)00314-1]
9 Chordas C, Manley F, Merport Moderate A, Chen B, Liptack C, Recklitis CJ. Screening for pain in pediatric brain tumor survivors using the pain thermomter. J Pediatr Oncol Nurs 2013; 30: 249-259 [PMID: 23867966 DOI: 10.1170/1043454213493507]
10 Gupta V, Chandrasrakar T, Ramani P. Determining toothache severity in pediatric patients. A study. J Indian Soc Pedod Prev Dent 2006; 24: 140-143 [PMID: 17065781 DOI: 10.4103/0970-4388.27894]
11 McGrath PA, Seifert CE, Speechley KN, Booth JC, Stitt L, Gibson MC. A new analogue scale for assessing children’s pain: an initial validation study. Pain 1996; 64: 435-443 [PMID: 8783307 DOI: 10.1016/0304-3959(95)00171-9]
12 Ahlquist ML, Fransen O. Encoding of the subjective intensity of sharp dental pain. Endod Dent Traumatol 1994; 10: 153-166 [PMID: 7995246 DOI: 10.1111/j.1600-9657.1994.tb00680.x]
13 Marshman Z, Hall MJ. Oral health research with children. Int J Paediatr Dent 2008; 18: 235-242 [PMID: 18445001 DOI: 10.1111/j.1365-263X.2008.00922.x]
14 Ryan-Wenger NA. Impact of the threat of war on children in military families. Am J Orthopsychiatry 2001; 71: 236-244 [PMID: 11347364 DOI: 10.1037/0002-9432.71.2.236]
15 Kennedy C, Kools S, Kong SK, Chen JL, Franck L, Wong TK. Behavioural, emotional and family functioning of hospitalized children in China and Hong Kong. Int Nurs Rev 2004; 51: 34-46 [PMID: 14764013 DOI: 10.1111/j.1466-7657.2003.00240.x]
16 Skybo T, Ryan-Wenger N, Su YH. Human figure drawings as a measure of children’s emotional status: critical review for practice. J Pediatr Nurs 2007; 22: 15-28 [PMID: 17234495 DOI: 10.1016/j.jnurst.2006.05.006]
17 Hamama L, Ronen T. Children’s drawings as a self-report measurement. Child Family Social Work 2009; 14: 90-102 [DOI: 10.1111/j.1365-2206.2008.00585.x]
18 Imuta K, Scarf D, Pharo H, Hayne H. Drawing a close to the use of human figure drawings as a projective measure of intelligence. PLoS One 2013; 8: e58991 [PMID: 23516590 DOI: 10.1371/journal.pone.0058991]
19 Balat GU. A comparison of concept development and human figure drawings of children who receive preschool education vs those who do not. Gifted Educ Int 2010; 26: 87-95 [DOI: 10.1177/0264942910006011]
20 Carries D, Ashby D, Underwood M. A systematic review of pain drawing literature: should pain drawings be used for psychologic screening? Clin J Pain 2006; 22: 449-457 [PMID: 16772800 DOI: 10.1097/JCP.0b013e318074f12f]
21 Aikman KG, Belter RW, Finch AJ. Human figure drawings: validity in assessing intellectual level and academic achievement. J Clin Psychol 1992; 48: 114-120 [PMID: 1556206 DOI: 10.1002/19920148:1-114]
22 Vélez van Meerveke A, Sandoval-Cárdenas C, Ibáñez M, Talero-Gutiérrez C, Fidallo D, Halliday K. validation study of human figure drawing test in a colombian school children population. Span J Psychol 2011; 14: 464-477 [PMID: 21568202 DOI: 10.5209/rev _SJP2011.v14.n41.42]
23 Unamaheshwari N, Asokan S, Kumaran TS. Child friendly colors in a pediatric dental practice. Indian J Soc Pedod Prev Dent 2013; 31: 225-228 [PMID: 24262394 DOI: 10.4103/0970-4388.121817]
24 Driessnack M. Children's drawings as facilitators of communication: a meta-analysis. J Pediatr Nurs 2005; 20: 415-423 [PMID: 16292822 DOI: 10.1016/j.pedn.2005.03.011]
25 Rollins JA. Tell me about it: drawing as a communication tool for children with cancer. J Pediatr Oncol Nurs 2005; 22: 203-221 [PMID: 15994339 DOI: 10.1177/1043454205277103]
26 Abell SC, Horkheimer R, Nguyen SE. Intellectual evaluations of adolescents via human figure drawings: an empirical comparison of two methods. J Clin Psychol 2008; 64: 811-815 [PMID: 18793661 DOI: 10.1002/jclp.205799180546]
27 Willcock E, Imuta K, Hayne H. Children’s human figure drawings do not measure intellectual ability. J Exp Child Psychol 2011; 100: 444-452 [PMID: 21620415 DOI: 10.1016/j.jcsp.2011.04.013]
28 Clatworthy S, Simon K, Tiedeman M. Child drawing: hospital
manual. *J Pediatr Nurs* 1999; 14: 10-18 [PMID: 10063244 DOI: 10.1016/S0882-5963(99)80055-4]

29 Clatworthy S, Simon K, Tiedeman ME. Child drawing: hospital-based an instrument designed to measure the emotional status of hospitalized school-aged children. *J Pediatr Nurs* 1999; 14: 2-9 [PMID: 10063243 DOI: 10.1016/S0882-5963(99)80054-2]

30 Aminabadi NA, Ghoreishizadeh A, Ghoreishizadeh M, Oskouei SG. Can drawing be considered a projective measure for children’s distress in paediatric dentistry? *Int J Paediatr Dent* 2011; 21: 1-12 [PMID: 20642462 DOI: 10.1111/j.1365-263X.2010.01072.x]

31 Wright GZ, Stigers J. Nonpharmacological management of children’s behaviors. In: Dean JA, Avery DR, Mc Donald RE. Dentistry for the child and adolescent. 9th ed. St. Louis: CV Mosby, 2011: 27-40 [DOI: 10.1016/B978-0-323-05724-0.50007-2]

32 Malviya S, Voepel-Lewis T, Burke C, Merkel S, Tait AR. The revised FLACC observational pain tool: improved reliability and validity for pain assessment in children with cognitive impairment. *Paediatr Anaesth* 2006; 16: 258-265 [PMID: 16490089 DOI: 10.1111/j.1460-9592.2005.01773.x]

33 Voepel-Lewis T, Merkel S, Tait AR, Trzcinka A, Malviya S. The reliability and validity of the Face, Legs, Activity, Cry, Consolability observational tool as a measure of pain in children with cognitive impairment. *Anesth Analg* 2002; 95: 1224-1229, table of contents [PMID: 12401598 DOI: 10.1097/00000539-200211000-00020]

34 Pasero C, McCaffery M. No self-report means no pain-intensity rating. *Am J Nurs* 2005; 105: 50-53 [DOI: 16205409 DOI: 10.1097/00000446-200510000-00032]

35 Payen JF, Bru O, Bosson JL, Lagrasta A, Novel E, Deschaux I, Lavagne P, Jacquot C. Assessing pain in critically ill sedated patients by using a behavioral pain scale. *Cirt Care Med* 2001; 29: 2258-2263 [PMID: 11801819 DOI: 10.1097/00003246-200112000-00004]

36 Bieri D, Reeve RA, Champion GD, Addicoat L, Ziegler JB. The Faces Pain Scale for the self-assessment of the severity of pain experienced by children: development, initial validation, and preliminary investigation for ratio scale properties. *Pain* 1990; 41: 139-150 [PMID: 2367140 DOI: 10.1016/0304-3959(90)90018-9]

37 Merkel SI, Voepel-Lewis T, Shayeveitz JR, Malviya S. The FLACC: a behavioral scale for scoring postoperative pain in young children. *Pediatr Nurs* 1997; 23: 293-297 [PMID: 9220806]

38 Nilsson S, Finnström B, Kokinsky E. The FLACC behavioral scale for procedural pain assessment in children aged 5-16 years. *Paediatr Anaesth* 2008; 18: 767-774 [PMID: 18613934 DOI: 10.1111/j.1460-9592.2008.02655.x]

39 Rayen R, Muthu MS, Chandrasekhar Rao R, Sivakumar N. Evaluation of physiological and behavioral measures in relation to dental anxiety during sequential dental visits in children. *Indian J Dent Res* 2006; 17: 27-34 [PMID: 16900892 DOI: 10.4103/0970-9290.29895]

40 Christophorou S, Lee GTR, Humphris GH. The reliability and validity of the Modified Child Dental Anxiety Scale: a study of Greek Cypriot school children. *Eur J Paediatr Dent* 2000; 1: 75-81

41 Majstorovic M, Veerkamp JS. Developmental changes in dental anxiety in a normative population of Dutch children. *Eur J Paediatr Dent* 2005; 6: 30-34 [PMID: 15839831]

42 Dogan MC, Seydaoglu G, Ugur S, Inaner BY. The effect of age, gender and socio-economic factors on perceived dental anxiety determined by a modified scale in children. *Oral Health Prev Dent* 2006; 4: 235-241 [PMID: 17153645]

43 Manepalli S, Nuvvula S, Kamatham R, Nirmala S. Comparative efficacy of a self-report scale and physiological measures in dental anxiety of children. *J Investig Clin Dent* 2014; 5: 301-306 [PMID: 23766146 DOI: 10.1111/jicd.12046]

44 Quiton RL, Greenspan JD. Sex differences in endogenous pain modulation by distracting and painful conditioning stimulation. *Pain* 2007; 132 Suppl 1: S134-S149 [PMID: 17951004 DOI: 10.1016/j.pain.2007.09.001]

45 Martlew M, Connolly KJ. Human figure drawings by schooled and un schooled children in Papua New Guinea. *Child Dev* 1996; 67: 2743-2761 [PMID: 9071761 DOI: 10.2307/1131750]

46 Daglioglu HE, Çalışdemir F, Alemdar M, Kangal SB. Examination of human figure drawings by normally developed children at preschool period. *Elementary Education Online* 2010; 9: 31-43

47 Bruck M. Human figure drawings and children’s recall of touching. *J Exp Psychol Appl* 2009; 15: 361-374 [PMID: 20025421 DOI: 10.1037/a0017120]

48 Groth-Marnat G, Roberts L. Human figure drawings and house tree person drawings as indicators of self-esteem: a quantitative approach. *J Clin Psychol* 1998; 54: 219-222 [PMID: 9467766 DOI: 10.1002/(SICI)1097-4679(199802)54

49 Veltman MM, Browne KD. The assessment of drawings from children who have been maltreated: a systematic review. *Child Abuse Rev* 2002; 11: 19-37 [DOI: 10.1002/car.712]

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