

Retrospective Study

# 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, like 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<sup>[1,2]</sup>, 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<sup>[3,4]</sup>. 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<sup>[5]</sup>. 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 scale (FLACC)/sound, eye, motor scale]<sup>[6,7]</sup>, self report measures [facial pain scale-revised (FPS-R)/pain thermometer/visual analogue scale/colour analogue scale/finger span test]<sup>[8-12]</sup> 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 varies<sup>[13]</sup>. 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 verbally<sup>[14]</sup>. Most of the children disguise the inner fears of their painful experience<sup>[15]</sup>, 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 child<sup>[16,17]</sup>. Children's drawing is thought to reflect his/her inner world; depicting various feelings and relating information concerning intelligence, psychological status and interpersonal style<sup>[18-24]</sup>. 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 clinically<sup>[25]</sup>.

Scoring systems for drawings were also developed, of which Good enough-Harris test, Koppitz developmental scoring system, Draw-a-person quantitative scoring system are renowned<sup>[26,27]</sup>. To assess the emotional status of hospitalized school age children, Child drawing: Hospital (CD: H) manual was specially developed<sup>[28,29]</sup>. This manual was applied in pediatric dental settings to assess the effect of pulp therapy and/or restorative treatments for carious primary molars<sup>[30]</sup>. 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 untreatable 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 behavior<sup>[31]</sup> 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<sup>[28]</sup> 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 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,  $\leq 43$ : 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<sup>[28]</sup>.

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<sup>[32]</sup>; 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<sup>[33-35]</sup>. 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<sup>[8,36]</sup>. 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<sup>[36]</sup>.

### 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 positive (+) and if otherwise as negative (-). If there was no negative score in any of the occasion, the child was designated as definitely positive (++)<sup>[31]</sup>. As a behavioral measure of pain and distress, FLACC scale<sup>[37]</sup> was used to score the LA administration and extraction procedures separately. FPS-R<sup>[8]</sup>, 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

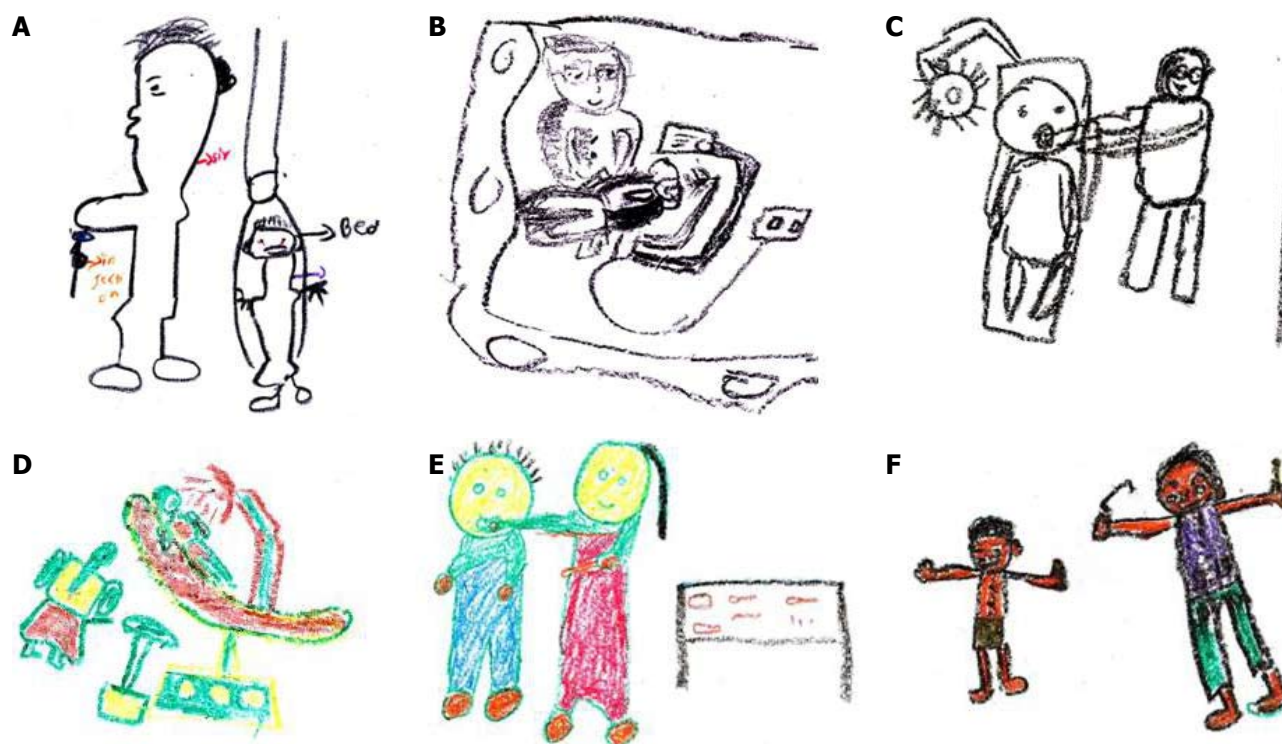
Based on the findings of a previous study conducted with sample size of 54, which compared drawing scores, applying CD: H manual, with behavioral measure of pain; and considering the findings of our pilot study on 10 children with behavioral measure as the primary outcome, and self report measure and 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





**Figure 1** Samples of children's drawings. A: Ages 11 years; gender: boy; Frankl: 4. FLACC score (LA): 2 (mild discomfort), FLACC score (Ext): 2 (mild discomfort); FPS-R score (LA): 6, FPS-R score (Ext): 2. 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; Frankl: 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; Frankl: 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; Frankl: 3. FLACC score (LA): 3 (mild discomfort), FLACC score (Ext): 0 (mild discomfort); FPS-R score (LA): 2, FPS-R score (Ext): 0. Child drawing: Hospital score: 68 (low stress). The child used only small part of paper for his drawing and included dental equipment (syringe and dental chair). However, the predominant colour used green. E: Ages 12 years; gender: boy; Frankl: 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; Frankl: 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.

correlation test.

## 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  $2.8 \pm 1.7$  (range: 0-10) and during extractions it was  $2.24 \pm 2.04$  (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  $74.1 \pm 16.2$  (range of 36-112). Some samples of children's drawings are presented in Figure 1.

### 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

**Table 1** Distribution of Child drawing: Hospital scale and facial pain scale-revised scores based on age, gender and accompanying person

Variables		Mean $\pm$ SD		CD: H					FPS-R (local anaesthetic administration)					FPS-R (extractions)				
				Classification														
				$\leq 43$	44-83	84-129	130-167	$> 168$	Mode	0	2-4	6-8	10	Mode	0	2-4	6-8	10
Age	4-6	76.43 $\pm$ 16.08	0	4	3	-	-	8	1	2	2	2	0	2	0	3	2	
				3.73%	2.80%				0.93%	1.86%	1.86%	1.86%		1.86%		2.8%	1.86%	
	> 6-9	76.06 $\pm$ 15.36	0	21	12	-	-	10	5	11	7	10	0	8	8	10	7	
				19.6%	11.20%				4.67%	10.28%	6.54%	9.34%		7.47%	7.47%	9.34%	6.54%	
	> 9-13	72.87 $\pm$ 16.75	3	43	21	-	-	2	6	38	17	6	0	17	24	18	8	
Gender				2.80%	40.18%	19.60%			5.60%	35.51%	15.88%	5.60%		15.88%	22.42%	16.82%	7.47%	
	Significance		0.70 <sup>NS</sup>					0.10 <sup>NS</sup>					0.44 <sup>NS</sup>					
	Boys	78.03 $\pm$ 15.29	0	35	23	-	-	2	7	22	17	12	0	14	17	17	10	
				32.71%	21.49%				6.54%	20.56%	15.88%	11.2%		13.08%	15.88%	15.88%	9.34%	
	Girls	69.41 $\pm$ 16.18	3	33	13	-	-	2	5	29	9	6	0	13	15	14	7	
Accompanying person				2.80%	30.8%	12.14%			4.67%	27.10%	8.41%	5.60%		12.14%	14.01%	13.08%	6.54%	
	Significance		0.08 <sup>NS</sup>					0.17 <sup>NS</sup>					0.97 <sup>NS</sup>					
	Mother	72.55 $\pm$ 15.61	1	39	15	-	-	2	5	27	14	9	0	13	14	15	13	
				0.93%	36.4%	14.01%			4.67%	25.23%	13.08%	8.41%		12.14%	13.08%	14.01%	12.14%	
	Father	77.61 $\pm$ 17.15	1	16	14	-	-	2	5	14	8	4	2	10	15	6	3	
Accompanying person				0.93%	14.95%	13.08%			4.67%	13.08%	7.47%	3.73%		9.34%	14.01%	5.60%	2.80%	
	Guardian	72.90 $\pm$ 16.36	1	13	7	-	-	2	2	10	4	5	8	4	13	10	1	
				0.93%	12.14%	6.54%			1.86%	9.34%	3.73%	4.67%		3.73%	12.14%	9.34%	0.93%	
	Significance		0.47 <sup>NS</sup>					0.90 <sup>NS</sup>					0.12 <sup>NS</sup>					

CD: H: Children drawing; Hospital scale; FPS-R: Facial pain scale-revised; NS: Not significant, SD: Standard deviation.

**Table 2** Distribution of faces, leg, activity, cry, consolability scale and frankl scores based on age, gender and accompanying person

Variables		FLACC (local anaesthetic administration)					FLACC (extractions)					Frankl (total score)			
		Mode	0	1-3	4-6	7-10	Mode	0	1-3	4-6	7-10	Mode	2	3	4
Age	4-6	4	0	2	5	0	3	1	3	1	2	3	0	4	3
				1.86%	4.67%			0.93%	2.80%	0.93%	1.86%			3.73%	2.80%
	> 6-9	4	0	16	14	3	4	4	14	12	3	4	4	5	24
				14.95%	13.08%	2.80%		3.73%	13.08%	11.20%	2.80%		3.73%	4.67%	22.42%
	> 9-13	2	4	52	11	0	2	19	41	7	0	4	7	9	51
Gender				3.73%	48.59%	10.28%		17.75%	38.31%	6.54%			6.54%	8.41%	47.66%
	Significance		< 0.01 <sup>1</sup>				< 0.01 <sup>1</sup>					0.06 <sup>NS</sup>			
	Boys	2	2	37	17	2	2	14	29	12	3	4	3	11	44
				1.86%	34.57%	15.88%		13.08%	27.10%	11.20%	2.80%		2.80%	10.28%	41.12%
	Girls	2	2	33	13	1	2	10	29	8	2	4	8	7	34
Accompanying person				1.86%	30.80%	12.14%		9.34%	27.10%	7.47%	1.86%		7.47%	6.54%	31.77%
	Significance		0.95 <sup>NS</sup>				0.82 <sup>NS</sup>					0.16 <sup>NS</sup>			
	Mother	2	1	34	19	1	2	9	32	11	3	4	7	9	39
				0.93%	31.77%	17.75%		8.41%	29.99%	10.28%	2.80%		6.54%	8.41%	36.44%
	Father	2	3	21	6	1	0	13	14	4	0	4	2	2	27
Accompanying person				2.80%	19.6%	5.60%		12.14%	13.08%	3.73%			1.86%	1.86%	25.23%
	Guardian	2	0	15	5	1	2	2	12	5	2	4	2	7	12
				14.01%	4.67%	0.93%		1.86%	11.20%	4.67%	1.86%		1.86%	6.54%	11.20%
	Significance		0.34 <sup>NS</sup>				0.07 <sup>NS</sup>					0.10 <sup>NS</sup>			

<sup>1</sup>Significant at 0.01 level. FLACC: Faces, leg, activity, cry, consolability scale; NS: Not significant.

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

**Table 3** Differences between/among scores (Child drawing: Hospital scale and facial pain scale-revised) in groups divided based on age, gender and accompanying person

Variables	Groups	Mean $\pm$ SD	One way ANOVA <i>P</i> value	Post hoc comparisons	Post hoc <i>P</i> value
CD: H	Age groups (4-6, > 6-9, > 9-13)	4-6: 76.4 $\pm$ 16.1	0.61 <sup>NS</sup>	4-6 <i>vs</i> > 6-9	1.00 <sup>NS</sup>
		> 6-9: 76.1 $\pm$ 15.4		> 6-9 <i>vs</i> > 9-13	0.66 <sup>NS</sup>
		> 9-13: 72.9 $\pm$ 16.7		4-6 <i>vs</i> > 9-13	0.86 <sup>NS</sup>
	Gender (boys and girls)	Boys: 78.0 $\pm$ 15.3	0.01 <sup>1</sup>	--	--
		Girls: 69.4 $\pm$ 16.2			
	Accompanying person (mother, father, guardian)	Mother: 72.6 $\pm$ 15.6 Father: 77.6 $\pm$ 17 Guardian: 72.9 $\pm$ 16.4	0.36 <sup>NS</sup>	Mother <i>vs</i> father Mother <i>vs</i> guardian Father <i>vs</i> guardian	0.38 <sup>NS</sup> 1.00 <sup>NS</sup> 0.59 <sup>NS</sup>
FPS-R (LA)	Age groups (4-6, > 6-9, > 9-13)	4-6: 6.0 $\pm$ 4.0	0.07 <sup>NS</sup>	4-6 <i>vs</i> > 6-9	0.92 <sup>NS</sup>
		> 6-9: 5.5 $\pm$ 3.8		> 6-9 <i>vs</i> > 9-13	0.14 <sup>NS</sup>
		> 9-13: 4.1 $\pm$ 2.9		4-6 <i>vs</i> > 9-13	0.33 <sup>NS</sup>
	Gender (boys and girls)	Boys: 5.0 $\pm$ 3.5	0.24 <sup>NS</sup>	--	--
		Girls: 4.2 $\pm$ 3.1			
	Accompanying person (mother, father, guardian)	Mother: 4.8 $\pm$ 3.9 Father: 4.1 $\pm$ 3.3 Guardian: 4.8 $\pm$ 3.6	0.63 <sup>NS</sup>	Mother <i>vs</i> father Mother <i>vs</i> guardian Father <i>vs</i> guardian	0.64 <sup>NS</sup> 1.00 <sup>NS</sup> 0.80 <sup>NS</sup>
FPS-R (Ext)	Age groups (4-6, > 6-9, > 9-13)	4-6: 6.0 $\pm$ 4.3	0.28 <sup>NS</sup>	4-6 <i>vs</i> > 6-9	0.78 <sup>NS</sup>
		> 6-9: 4.9 $\pm$ 3.9		> 6-9 <i>vs</i> > 9-13	0.54 <sup>NS</sup>
		> 9-13: 4.0 $\pm$ 3.5		4-6 <i>vs</i> > 9-13	0.41 <sup>NS</sup>
	Gender (boys and girls)	Boys: 4.7 $\pm$ 3.8	0.50 <sup>NS</sup>	--	--
		Girls: 4.2 $\pm$ 3.6			
	Accompanying person (mother, father, guardian)	Mother: 5.0 $\pm$ 3.9 Father: 3.1 $\pm$ 3.3 Guardian: 5.0 $\pm$ 3.4	0.06 <sup>NS</sup>	Mother <i>vs</i> father Mother <i>vs</i> guardian Father <i>vs</i> guardian	0.08 <sup>NS</sup> 1.00 <sup>NS</sup> 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.

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<sup>[16]</sup>. 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<sup>[38-42]</sup>. 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

**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 $\pm$ SD	One way ANOVA <i>P</i> valve	Post hoc comparisons	Post hoc <i>P</i> valve
FLACC (LA)	Age groups (4-6, > 6-9, > 9-13)	4-6: 3.9 $\pm$ 1.9	< 0.01 <sup>2</sup>	4-6 <i>vs</i> > 6-9	0.97 <sup>NS</sup>
		> 6-9: 3.7 $\pm$ 2.2		> 6-9 <i>vs</i> > 9-13	< 0.01 <sup>2</sup>
		> 9-13: 2.3 $\pm$ 1.2		4-6 <i>vs</i> > 9-13	0.06 <sup>NS</sup>
	Gender (boys and girls)	Boys: 2.9 $\pm$ 1.8	0.61 <sup>NS</sup>	--	--
		Girls: 2.8 $\pm$ 1.6			
	Accompanying person (mother, father, guardian)	Mother: 3.0 $\pm$ 1.6 Father: 2.6 $\pm$ 1.8 Guardian: 3.0 $\pm$ 1.9	0.60 <sup>NS</sup>	Mother <i>vs</i> father Mother <i>vs</i> guardian Father <i>vs</i> guardian	0.62 <sup>NS</sup> 1.00 <sup>NS</sup> 0.75 <sup>NS</sup>
FLACC (Ext)	Age groups (4-6, > 6-9, > 9-13)	4-6: 3.9 $\pm$ 2.8	< 0.01 <sup>2</sup>	4-6 <i>vs</i> > 6-9	0.67 <sup>NS</sup>
		> 6-9: 3.2 $\pm$ 2.4		> 6-9 <i>vs</i> > 9-13	< 0.01 <sup>2</sup>
		> 9-13: 1.6 $\pm$ 1.5		4-6 <i>vs</i> > 9-13	0.01 <sup>2</sup>
	Gender (boys and girls)	Boys: 2.3 $\pm$ 2.2	0.93 <sup>NS</sup>	--	--
		Girls: 2.2 $\pm$ 1.9			
	Accompanying person (mother, father, guardian)	Mother: 2.5 $\pm$ 1.9 Father: 1.3 $\pm$ 1.5 Guardian: 3.0 $\pm$ 2.4	< 0.01 <sup>2</sup>	Mother <i>vs</i> father Mother <i>vs</i> guardian Father <i>vs</i> guardian	0.02 <sup>1</sup> 0.62 <sup>NS</sup> 0.01 <sup>2</sup>
Frankl (total)	Age groups (4-6, > 6-9, > 9-13)	4-6: 3.4 $\pm$ 0.5	0.68 <sup>NS</sup>	4-6 <i>vs</i> > 6-9	0.86 <sup>NS</sup>
		> 6-9: 3.6 $\pm$ 0.7		> 6-9 <i>vs</i> > 9-13	0.69 <sup>NS</sup>
		> 9-13: 3.7 $\pm$ 0.7		4-6 <i>vs</i> > 9-13	0.94 <sup>NS</sup>
	Gender (boys and girls)	Boys: 3.7 $\pm$ 0.6	0.17 <sup>NS</sup>	--	--
		Girls: 3.5 $\pm$ 0.8			
	Accompanying person (mother, father, guardian)	Mother: 3.6 $\pm$ 0.7 Father: 3.8 $\pm$ 0.5 Guardian: 3.5 $\pm$ 0.7	0.17 <sup>NS</sup>	Mother <i>vs</i> father Mother <i>vs</i> guardian Father <i>vs</i> guardian	0.32 <sup>NS</sup> 0.82 <sup>NS</sup> 0.22 <sup>NS</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		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
		Significance	-	0.01 <sup>2</sup>	0.72 <sup>NS</sup>	0.02 <sup>1</sup>	0.07 <sup>NS</sup>	0.76 <sup>NS</sup>
	> 6-9	Correlation	1	-0.09	-0.24	0.20	-0.12	0.27
		Significance	-	0.63 <sup>NS</sup>	0.19 <sup>NS</sup>	0.26 <sup>NS</sup>	0.50 <sup>NS</sup>	0.63 <sup>NS</sup>
	> 9-13	Correlation	1	0.21	0.17	-0.08	0.05	0.07
		Significance	-	0.09 <sup>NS</sup>	0.17 <sup>NS</sup>	0.53 <sup>NS</sup>	0.67 <sup>NS</sup>	0.56 <sup>NS</sup>
Gender	Boys	Correlation	1	0.11	-0.12	0.12	0.09	0.01
		Significance	-	0.40 <sup>NS</sup>	0.37 <sup>NS</sup>	0.38 <sup>NS</sup>	0.52 <sup>NS</sup>	0.94 <sup>NS</sup>
	Girls	Correlation	1	0.18	0.18	0.11	0.07	0.15
		Significance	-	0.22 <sup>NS</sup>	0.21 <sup>NS</sup>	0.46 <sup>NS</sup>	0.65 <sup>NS</sup>	0.32 <sup>NS</sup>
Accompanying person	Mother	Correlation	1	0.18	0.10	0.19	0.28	0.01
		Significance	-	0.20 <sup>NS</sup>	0.47 <sup>NS</sup>	0.17 <sup>NS</sup>	0.04 <sup>1</sup>	0.98 <sup>NS</sup>
	Father	Correlation	1	-0.06	-0.01	0.02	0.08	0.1
		Significance	-	0.74 <sup>NS</sup>	0.97 <sup>NS</sup>	0.91 <sup>NS</sup>	0.68 <sup>NS</sup>	0.60 <sup>NS</sup>
	Guardian	Correlation	1	0.55	0.11	0.20	-0.12	0.33
		Significance	-	0.01 <sup>2</sup>	0.65 <sup>NS</sup>	0.38 <sup>NS</sup>	0.61 <sup>NS</sup>	0.14 <sup>NS</sup>
Total	Correlation	1	0.17	0.04	0.12	0.08	0.12	
	Significance	-	0.09 <sup>NS</sup>	0.72 <sup>NS</sup>	0.21 <sup>NS</sup>	0.44 <sup>NS</sup>	0.24 <sup>NS</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; L.A: Local anaesthetic administration; Ext: Extractions.

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<sup>[30]</sup>. 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



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 companioned by mother.

Gender difference in anxiety of children was reported frequently in the existing literature; some reporting high anxiety scores in girls<sup>[40,43,44]</sup>, where as others depicting no difference<sup>[42]</sup>; 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<sup>[45]</sup>.

Scoring of drawings using CD: H was practically easy, but, this manual was originally developed to determine the effect of hospitalization on children<sup>[29]</sup>. 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 colour 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<sup>[19,26,27,46]</sup>. However, we substantiate our study, with the studies that proved no effect of these factors on drawing talent of children<sup>[18,47-49]</sup>.

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 carious 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 fear: 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.

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