ORIGINAL RESEARCH

Jeet Wheel Scale: A Novel Tool for Evaluation of Dental Anxiety in Children

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Abstract

Background: One of the major concerns of the current era is dental anxiety in Pediatric Dentistry. Kids are very well adapted to emojis or emoticons nowadays, and they represent emotions or moods better than a cartoon picture. Therefore, this study was conducted to evaluate a newly designed anxiety rating scale. The Jeet Wheel Scale (JWS) uses emoticons and colors to assess the anxiety or mood of the child during the first visit of the child.

Aim: The aim was to establish the novel anxiety rating scale and compare it with the Venham Picture Test (VPT) and Facial Image Scale (FIS).

Materials and methods: The study included 100 healthy children aged 4–8 years, and their dental anxiety was assessed using the JWS, VPT, and FIS at their first dental appointment, along with their scale preference.

Results: The mean and standard deviation of anxiety scores measured using the FIS, VPT, and JWS were 1.67 ± 0.88, 1.99 ± 1.17, and 2.79 ± 1.35, respectively. Among the scales used, a significant difference was observed. A strong correlation was observed with the Pearson correlation test. The results indicated a strong correlation (0.863) between the JWS and VPT, and a strong correlation (0.802) between the JWS and the FIS. Based on the above observations, it could be confirmed that the JWS has high validity. Children preferred the JWS over the other two established scales.

Conclusion: The JWS was found to be more efficient for assessing dental anxiety in children.

Keywords: Anxiety rating scale, Dental anxiety, Jeet Wheel Scale, New anxiety rating scale.

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Introduction

Dental anxiety is a significant concern in a child's dental care management. Despite significant advancements in dentistry, dental anxiety remains a major factor commonly faced by pediatric dentists.[1] The goal of every dental professional or pediatric dentist is to provide their patients with a comfortable and stress-free environment during treatment.

The role of a pediatric dentist in managing a child with dental anxiety is to perform a painless procedure to achieve cooperation from the patient.[2] This can be achieved by understanding the psychology behind the behavior of the child. Once we understand the feelings of the child and the reasons for the fear, we can manage the anxiety efficiently.

Children have various moods and feelings. Assessment of the exact mood of the child would be beneficial to eliminate the cause of anxiety and manage the patient efficiently. Various nonpharmacological techniques, such as tell-show-do, ask-tell-ask, tell-play-do, audio distraction, and audio-visual distraction techniques, help distract the child and achieve an anxiety-free environment.[3]

Different approaches for assessing dental anxiety have already been described in the literature, including perceptual approaches like dental fear picture tests for children, questioning, measuring, scoring, and indirect methods such as physiological tests.[4] However, these methods exhibit problematic validity and reliability due to challenges in story interpretation and score optimization.

The psychological tests widely used in children include the Corah Scale of Dental Anxiety[4] and the Modified Child Dental Anxiety Scale, which use questionnaires. These scales are among the most widely used and accepted for evaluating anxiety, but they do not cover all aspects of anxiety, and the questionnaire format can be complicated for a child. Picture-based factors appear as an option to address the limitations of these scales. The Facial Index Scale and Venham's Pictorial Test have been used in multiple studies[57] to measure dental anxiety prior to receiving any dental care. These scales have some limitations; for example, the Venham Picture Test (VPT) scale figures are all cartoon pictures of male gender, which could cause problems with young female patients.[7]

Additionally, the imprecise existence of those figures on the scale mystifies the child, making it a task that requires time. Moreover, the children may not understand the figures used in such scales. An optimal measure of anxiety should be easy to administer, less time-consuming, engaging, accessible, and legible to young children with minimal verbal and language abilities, and incorporate a scoring system.[8]

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Children are familiar with emoticons, so they can correlate their mood with them very easily.[8] Colors have been shown to reflect and depict different moods psychologically.[9] Colors can make patients more comfortable and reduce their stress; for example, green depicts frustration, purple is associated with fear, pink represents sadness, orange signifies excitement, red indicates anger, and yellow reflects happiness.[10]

Taking all of this into account, a novel scale for anxiety evaluation, the Jeet Wheel Scale (JWS), was designed using emoticons and colors. In this scale, each emoticon is linked to a respective color, allowing the child to quickly express their mood and provide insight into their anxiety and fear effectively. It has been designed with the interests and attractions of the new generation of children in mind, emphasizing their preference for multimedia tools rather than paper cartoons.

Therefore, the present study was conducted to evaluate children's dental anxiety using the newly developed JWS with emoticons and colors and to validate it against established scales like the VPT and Facial Image Scale (FIS) during their initial dental appointment.

Materials and Methods

For this investigation, a sample size of 100 was established. The following formula was used to determine the sample size for the current study: $n = 4PQ/L2$ [$P = 6.3\%$ (according to earlier research); $Q = 100 - P$, $L = 5\%$].

Based on the inclusion and exclusion criteria, 100 children between the ages of 4 and 8 who were visiting the Department of Pediatric and Preventive Dentistry's OPD were chosen at random. Children in the department's outpatient dental clinic waiting area were contacted by staff members who inquired about the child's prior dental appointment history.

Inclusion Criteria

- No previous dental experience or hospitalization.
- Patient age: 4–8 years.
- Without any disease or sickness.
- First visit to a dentist.
- Need for local anesthesia administration.

Exclusion Criteria

- Physically or mentally disabled children.
- Children who have undergone dental treatment.

Parents/guardians were informed about the study and given the opportunity to ask any questions before providing their consent. The study was conducted after receiving ethical committee clearance from the institution. Children who fulfilled the requirements and reported to the department were included in the research until the target sample size was reached. The dental anxiety of each child was assessed using three different scales (JWS, VPT, and FIS). The sequence in which the scales were presented to each child was determined using a computer-driven sequence generator. Two investigators independently presented all the scales to each patient and recorded the results to avoid interexamination errors. To check reliability and eliminate interexaminer bias, a kappa test was conducted, yielding a score of 0.90. The anxiety scores were recorded immediately after the examination.

The JWS consists of 8 emoticon pictures, such as excited, happy, angry, sad, crying, frustrated, scared, and shouting, each paired with a color, such as orange, yellow, red, pink, sky blue, green, purple, and white, arranged in segments on a wheel.[10–12] The wheel displays different feelings and moods of the child, ranging from excited to scared to shouting, representing a spectrum from positive to the most negative feelings or moods. To eliminate bias, all emotions were jumbled and not displayed in a sequence from positive to negative feelings or vice versa.

The youngster was instructed to select the color-coded emoticon on the wheel that most accurately represented their current emotion or state of mind (Figs 1 and 2). The scale was scored from 1 to 8, with excited = 1, happy = 2, sad = 3, scared = 4,

Fig. 1: Jeet Wheel Scale

Figs 2A to C: Scales used in the study; (A) JWS; (B) FIS; (C) VPT

frustrated = 5, angry = 6, crying = 7, and shouting = 8 (Fig. 1 and Table 1). It is a novel anxiety rating scale that can be used for every child who needs treatment under a local anesthesia procedure, whether in an emergency or nonemergency context.

Five images, ranging from the happiest to the saddest, comprise the FIS. Children were given the scale as part of the study and asked to select the picture that best reflected their current state of mind (Fig. 2). To record the scores, values ranging from one to five were assigned, with one representing the happiest face and five representing the saddest face.[13]

The Venham Pictorial Scale consists of eight cards, each featuring two figures—one representing an anxious state and the other a non-anxious state. The children were instructed to indicate which figure best represented the feeling they were experiencing at the time. Each card was displayed in the sequence it was revealed. When a child selected an anxious figure, they received a score of 1, and when they selected a nonanxious figure, they received a score of 0 (Fig. 2). The cumulative score was added to arrive at a final score, with a maximum possible score of eight.[5,13]

The gathered data was tabulated and statistically analyzed using categorical variables (frequency and percentage) and continuous variables (mean and standard deviation) with SPSS statistical software. All explanatory and outcome parameters underwent descriptive analysis. The average age and mean anxiety levels across different gender rating scales were compared using the independent Student's *t*-test and Friedman's test. To compare the anxiety ratings between various rating scales, Pearson's correlation test was used.

Results

Among the 100 children who attended their first dental appointment, 56 were male and 44 were female, with mean ages of 7.62 ± 2.68 and 7.64 ± 2.55, respectively. There was no discernible difference in the mean ages of the male and female children (Table 2). The group included 69 children aged 4–5 and 31 children aged 6–8. Mean anxiety values were 2.79 ± 1.35, 1.67 ± 0.88, and 1.99 ± 1.17, respectively, as assessed by the JWS, FIS, and VPT. There were significant differences in the average anxiety levels among the three scales, as determined by the Friedman test ($p > 0.001$) (Table 3). The relationship between the VPT, FIS, and JWS was assessed using the Pearson correlation test. A strong agreement was observed between the JWS and VPT ($r = 0.863$, $p > 0.001$), suggesting that the JWS assessed anxiety similarly to the VPT. Significant associations were also found between the JWS and FIS ($r = 0.802$, $p > 0.001$) and between the FIS and VPT ($r = 0.766$, $p > 0.001$), suggesting that anxiety was measured consistently across the scales (Table 4).

Participants in this study favored the JWS over the FIS and VPT; none of the participants chose the FIS. The children in every group preferred the scales in the following order: JWS > VPT > FIS (Table 5 and Fig. 3). Males and younger children showed a stronger preference for the JWS than females did (78.8 and 82.6%, respectively).

Table 1: Jeet Wheel Scale score, gradient, and inference

Score	*Scale gradients*	*Inference*
1	Excited	No intervention needed
2	Happy	No intervention needed
3	Sad	Mild intervention needed
4	Scared	Moderate intervention needed
5	Frustrated	Moderate intervention needed
6	Angry	Severe intervention needed
7	Crying	Severe intervention needed
8	Shouting	Severe intervention needed

Table 2: Distribution of study samples by age and gender using Student *t*-test

Gender	*N*	*Mean age ± SD*	*t*	*p*
M	56	7.62 ± 2.68		
F	44	7.64 ± 2.55	0.38	0.97
Total	100	7.63 ± 2.61		

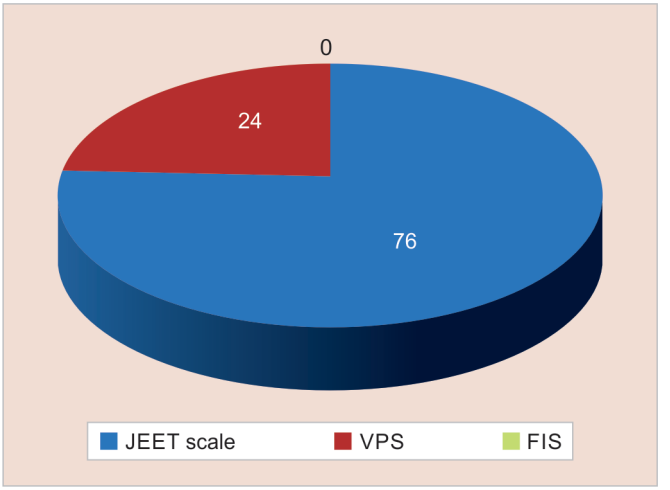

Fig. 3: Preferences for different anxiety rating scales: JWS, VPT, and FIS

Table 3: Table describing mean and standard deviation of various scales used for anxiety rating

	N	*Mean ± SD*	*Minimum*	*Maximum*	*p-value*
JWS	100	2.7900 ± 1.35061	1.00	8.00	
FIS	100	1.6700 ± 0.87681	1.00	5.00	<0.001
VPT	100	1.9900 ± 1.16771	0.00	6.00	

Table 4: Correlations between different anxiety rating scales using Pearson correlation test

Scales	*N*	*r*	*p-value*
JWS with FIS	100	0.802	0.001*
FIS with VPT	100	0.766	0.001*
VPT with JWS	100	0.863	0.001*

*$p < 0.05$ signifies statistically significant.

Table 5: Age and gender comparison of liking/preference for different anxiety rating scale among study subjects using Chi-squared test

		JWS		*VPT*		*FIS*			
Variable	*Category*	*N*	*%*	*N*	*%*	*N*	*%*	*χ^2 value*	*p-value*
Age	4–5 years	57	82.6	12	17.4	0	0	5.330	0.021
	6–8 years	19	61.3	12	38.7	0	0		
Gender	Male	41	78.8	11	21.2	0	0	0.481	0.488
	Female	35	72.9	36	27.1	0	0		

Discussion

Dental anxiety is a specific issue that frequently arises in children around the beginning of puberty[14,15] and it is often distressing to parents, dentists, and the children themselves. While 10–20% of children report high levels of anxiety, nearly half of children experience mild to severe dental anxiety.[15,16] The unfamiliarity of strangers and potentially invasive procedures during a dental clinic visit can represent daunting situations for young patients. For sensitive and nervous individuals, managing these unfamiliar circumstances can be intimidating. Not surprisingly, anxiety-related behaviors have been identified as one of the most challenging aspects of guiding children during dental activities.[16] It is also essential to recognize and measure fear.

According to Buchanan and Niven[17] the best scale for evaluating anxiety in children should be brief, cover topics related to pediatric dentistry, be easy to score and understand, and accurately reflect the child's feelings to maximize their response and minimize execution time. Additionally, the scale should be simple to use with younger children who have weaker cognitive and linguistic skills. No differences in anxiety scores were observed between males and females in this study, which is consistent with findings from other studies.[18,19]

Since the FIS and VPT are image scales used to measure anxiety in young children during their first dental appointment, we compared them to the JWS in this study (Fig. 3). The JWS, which consists of emoticons and colors, is simpler and less confusing than questionnaires.

The study showed that all scales were strongly associated with each other (Table 4). Nevertheless, the Friedman test revealed a substantial difference in mean anxiety scores (Table 3), highlighting a significant interest in the research findings. The disparity between the JWS (2.79) and VPT (1.99) could be attributed to the lower mean anxiety level observed with the FIS (1.67). The high degree of agreement between the JWS and both the VPT and FIS supports the validation of the novel JWS. Measurements of dental anxiety using the JWS demonstrated a reasonably strong correlation with the VPT, as children preferred the JWS. The figures in the VPT cards, which appeared similar and required time for interpretation, may have contributed to this preference.

Furthermore, young children find the JWS quite engaging, as they are accustomed to using emoticons on various multimedia and social networking platforms to communicate their feelings. The JWS incorporates both colors and emojis. In contrast, the VPT features all cards with male figures, which may make it difficult for a young female to relate them to her own anxiety. The JWS, with its use of emoticons and colors, avoids gender bias and is designed to be more universally relatable (Fig. 1).

A correlation was found between the JWS and the FIS. According to Buchanan and Niven,[17] the FIS is an effective predictor of dental anxiety assessment for children. However, young children often struggle to understand the FIS illustrations, and none of the study participants preferred the FIS over the other two scales used. The JWS offers several advantages for younger children with limited language and cognitive abilities. It is engaging, simple for children to express their feelings, quick and easy to use, does not require questionnaires, is applicable to both sexes, and provides immediate dental anxiety scores. This allows dentists to employ the best behavior control techniques for efficient and safe dental care.[20]

Conclusion

A newly developed, child-friendly tool to assess dental anxiety is called the JWS. The study's results indicated that the JWS generated results similar to those of the VPT and FIS. Its ease of use and readily identifiable emoticons make it a valuable standard for determining how anxious young children are about their dental appointments. The JWS is a simple, appealing, quick, and effective method for assessing children's dental anxiety, making it a novel option for evaluating anxiety in young children.

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