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Is there a link between dermatoglyphics and the Frankl behavior rating scale in the paediatric dental setting: A pilot study

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Highlights

- Children who had fingerprints with the loop or whorl patterns were more likely to receive negative and positive evaluation of Frankl's behaviour, respectively.
- After determining the anticipated Frankl's behaviour rating scale via dermatoglyphics, the pediatric dentist can plan the behaviour management techniques well in advance.
- The pediatric dentist will benefit from knowing the anticipated child's behaviour pattern prior to the initial dental visit.

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Abstract

Aim: Dermatoglyphics appears during the 12th and 13th weeks of pregnancy and persists throughout life. Fingerprints are blueprints for one's personality; they can provide information about one's perception, emotions, intellect, and motivation. Dermatoglyphic is a non-invasive and low-cost method of obtaining illness information. The aim of this study was to see if there was a link between distinct fingerprint patterns and Frankl's behavior rating scale in children aged 6 to 12. **Methods:** A total of 52 participants between the ages of 6 and 12 years old received dental procedures and were scored using Frankl's behavior rating scale. Children were divided into three groups: Group 1: Whorl, Group 2: Loops, and Group 3: Arches. After scanning fingerprints of 10 fingers with a SecuGen Hamster Pro 20 biometric finger scanner, the resulting fingerprint pattern types were compared to Frankl's behavior rating scale. **Results:** Many non-cooperative participants had loop pattern fingerprints (46.4%), while most cooperative participants had whorl pattern fingerprints (58.3%). **Conclusions:** Children with a loop pattern fingerprint were more likely to receive a negative assessment. On the other hand, children with whorl patterns were more common among the positive participants.

Keywords: Behavior Rating Scale; Dermatoglyphics; Pediatric Dentistry

INTRODUCTION

Cummins coined the term dermatoglyphics in 1926. Dermatoglyphics is derived from the Greek word derma, which means skin, and glyphic engravings.[1] Dermatoglyphics develop during the 12th and 13th weeks of pregnancy and remain consistent throughout life.[2] Dermatoglyphics is the name given to the study of fingerprints. Dermatoglyphics is a low-cost, non-invasive method of determining illness information. A few studies have discovered a link between fingerprints and disease in medicine and dentistry, such as dermatoglyphics and chromosome abnormalities,[3] Kidney disorders,[4] Hypertension[5,] and Breast cancer[6]. The association between oral diseases and fingerprints has been studied in depth[7]. Various authors investigated the association between fingerprint type and periodontal disease.[8-10] Similarly, for dental caries[11-12] and malocclusions study was explored.[13]

Various rating scales for grading the behavior of the children are available. Frankel's behavior rating scale is frequently used to assess a child's behavior. In pediatric dentistry, behavior management and the children's cooperation are critical to the success of any dental surgery. The ability to counsel children favorably during their dental experience and instill a definite dental approach to improving their oral health is at the heart of pediatric dentistry practice.[14]

Many behavioural rating scales for evaluating children's behavior during dental visits have been published. Frankel's Behavior Rating Scale (FBRS), developed in 1962, is widely utilized in pediatric dental investigation and ordinary clinical practice for behavior evaluation. Frankl's Behavior Rating Scale classifies a child's behavior into four categories, ranging from negative to positive, based on how they behave throughout the dental treatment (Table 1). These categories are assigned by the treating clinician and can be helpful at various stages of therapy. Frankl's Conduct Rating Scale is regarded as one of the most reliable measures for assessing children's behavior in a pediatric dental setting.[15] According to the current medical literature, no study has been conducted to date associating Frankl's behavior rating scale with dermatoglyphics during the first dental visit. Therefore our study was conducted to determine whether there is a possible relationship between different fingerprint patterns and Frankl's behavior rating scale in children aged 6 to 12 years.

METHODS

A total sample size of 52 was determined with an error rate of 5% with a power of 80%. This pilot cross-sectional study randomly included fifty-two children who reported to the Department of Pedodontics and Preventive Dentistry between February 2021 and January 2022 for their first dental visit. The Institutional ethical committee accepted the study (CODS/IEC/103/2021). Prior to the study, the subjects gave their informed written consent. The inclusion criteria were children aged 6 to 12 years old, regardless of dental treatment methods. No medical, congenital, psychological, or mental illnesses and no history of penetrating trauma or burning that would have altered the dermatoglyphic pattern were used as exclusion criteria.

Following the conclusion of the dental treatment, all subjects were rated using Frankl's behavior rating scale, which was followed by biometric recording utilizing a SecuGen Hamster Pro 20, which included a finger scanner of all ten fingers on the left and right hand (Figure 1). If an image's resolution was poor, the technique was repeated until the desired resolution was achieved. The fingerprints of the subjects were recognized and categorized by a primary professional investigator. The classification and recognition of fingerprints were done based on Agrawal's classification.[16] Each subject's classified patterns were double-checked for any discrepancies.

Table 1. Frankl scale of subjects' behaviour

Frankl scale	Type of behavior
Definitely negative (- -)	Resenting treatment, severe crying, fear, phobia, or any evident sign of extreme negativism
Negative (-)	Unwillingness to accept the treatment, lack of cooperation, some evidence of negative behavior but not considerable (bad temper
Positive (+)	Accepting the treatment while being careful, the tendency to agree with the dentist, the child cooperates with the dentist conditionally
Definitely positive (+ +)	The child well communicates with the dentist, is interested in dental procedures, laughs, and enjoys the treatment

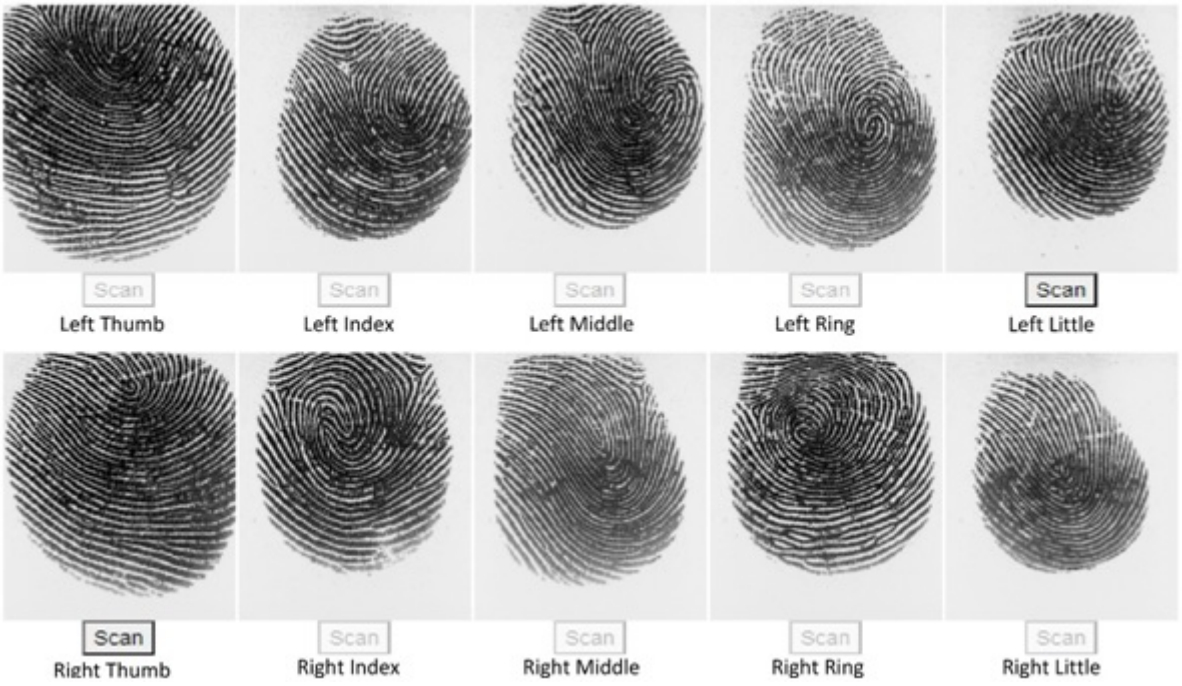

Figure 1. Fingerprint patterns of left and right hand

Following that, using a Windows-10 64-bit operating system, the collected fingerprints were examined for different types such as whorls, loops, and arches, and groups were assigned accordingly. Due to privacy concerns, no biometric data was saved, and just an image of a fingerprint was received.

The first group was the whorl which represent the intensity of character and intelligence. The more whorls there are, the more influential the trait is in the person. Furthermore, when combined with denser ridge counts between the delta and core, the whorl pattern indicates a better comprehension of the corresponding cognitive capacities and human behavior. The second group in our study was loops that were most prevalent features on a person's fingerprints and random sample space of multiple fingerprints. They are distinguished by ridges that flow from one side of the fingertip, loop around the middle of the finger pad, and then loop back in the same direction. These loops can run either towards or away from the thumb. The third Group consisted of arches which were only about 5% to 10% of the total fingerprints collected in a random sample space. People who have arches on any finger have

demonstrated steady, inflexible, or practical approaches to the relevant brain functions tasks.

After allocating the subject to the group, the lead investigator evaluated the association between distinct fingerprint patterns and Frankl's behavior rating scale in children. The significance level was set at $p<0.05$. The data was gathered and entered into a Microsoft Excel document, and statistical analysis was carried out using version 23 of IBM SPSS Statistics for Windows (IBM Corp., Armonk, N.Y., USA). We used the chi-square test for categorical data because there were more than two groups, and the data in our study did not follow a normal distribution. Therefore, the associations between dermatoglyphics and the Frankl Behavior Rating Scale were estimated using the chi-square test.

RESULTS

There were 36 males and 16 females among the 52 study participants, with an average of 8.73 years (Table 2). Male participants were non-cooperative in 61.1% of cases, while female participants were cooperative in 62.5% of subjects. There was a substantial difference in age between the cooperative and non-cooperative participants (Table 3). The girls were more cooperative than the boys. In terms of patient cooperation, there was no statistically significant difference between the genders. The relationship between a child's behavior and fingerprint patterns was not statistically significant ($p=0.38$). The majority of non-cooperative participants (61.9%) had loop pattern fingerprints, while the majority of cooperative subjects (56%) had whorl pattern fingerprints (Table 4). According to Frankel's scale, the definitely negative participants had more loop patterns, while Frankel's positive had more whorl patterns. Frankel's behavior scale definitely positive rating was not met by any study participant (Table 5).

Table 2. Characteristics of study population

Sl.No:	Characteristics	Value
1	Total number of participants	52
2	Mean age of study participants	8.73
3	Number of male participants	36
4	Number of female participants	16

DISCUSSION

Children's behaviour management is a clinical art and skills developed through time to establish excellent communication, remove fear, and establish a trusting connection between the child, the dentist, and the parents, which will help the child develop a positive attitude about dental care.

Dermatoglyphic patterns are unique to each person and do not change once developed. The development of dermatoglyphic patterns begins in the sixth week of pregnancy with the appearance of fetal pads and ends in the 24th week of pregnancy with appearance of patterns on the skin's surface. They remain unmodified from this point onwards. Dermatoglyphics is a sensitive indicator of intrauterine defects and is considered a window of congenital abnormalities.[17]

Dermatoglyphic patterns have been used as an oral health marker that can be used to predict a child's genetic propensity. As a result, it is employed as a biometric analyser to identify individuals and spot specific diseases/syndromes in preventive medicine.[17] Frankl's behaviour rating scale is a valuable tool for qualitatively categorizing a child's behavior. Predicting a child's likelihood of behaviour can help deal with potentially uncooperative patients, which can be accomplished by discovering signs that can anticipate a child's behavior before visiting the dentist.[18] The study conducted by Singh[19] found that children with a large percentage of loop type fingerprints were cooperative. In contrast, children with whorl type fingerprints had more challenging interactions and reduced cooperation was in the uncooperative group.

Table 3. Comparison of gender and age of study participants and behaviour

Variable	Non-co-operative		Co-operative		p value
Gender	n	%	N	%	
Male	22	61.1	14	38.9	0.12
Female	6	37.5	10	62.5	
Mean Age of participants	28 %		24 %		0.001

Table 4. Association between child's behaviour and fingerprint

Fingerprint pattern	Behaviour Non-cooperative (%)	Cooperative (%)	p value	Intra-pattern comparison for behaviour	p value
Whorl	44	56	0.38	Whorl Vs Loop	0.22
Loop	61.9	38.1		Loops vs Arch	0.83
Arch	66.7	33.3		Arch Vs Whorl	0.31

Our findings contradict the Mokhtari[20], as the loop and whorl fingerprint patterns are more common in non-cooperative and cooperative children aged 6 to 12 years. Mokhtari[20] concluded a link between fingerprint type and children's behaviour. It was found that non-cooperative subjects had the whorl figure print patterns, and cooperative participants had loop fingerprint patterns in the Iranian population. Jindal[13] explored the correlation between dermatoglyphics and malocclusion and revealed that dermatoglyphics could be an effective early indication of malocclusion.

According to Singh[11], individuals' risk of dental caries increases with a whorl pattern and lowers with an arch pattern. Chinmaya[12] concluded that an individual's dental caries experience was linked to their fingerprint, and the dermatoglyphics could be used as a sign of dental caries. Cleft lip and palate patients have more radial and ulnar loops, according to Soni[21]. Sharma[22] discovered a considerable variation in loops between caries and non-caries participants. Atasu[23] revealed a substantial variation in dermatoglyphics pattern between caries-free and caries-affected participants, with caries-affected subjects having whorls on their fingertips and caries-free subjects having ulnar loops. According to Saxena[24], the likelihood of dental caries increases with whorl pattern incidence and decreases with loop pattern fingerprint. Vaidya[8] stated that dermatoglyphics leads to the early detection of genetic abnormalities of the oral cavity. Tikare[9] concluded that dermatoglyphics could be a valuable tool in treating malocclusion. In our study, we looked at the child's behaviour during the first visit to the pediatric dentist's office. Regardless of whether the child's behaviour improves or deteriorates during consecutive visits, the pattern of the figure print will remain if analyzed the same.

Table 5. Association between fingerprint pattern and Frankl scale ratings

Frankl scale	Whorl	Loop	Arch
Definitely negative	0	2	1
Negative	11	11	3
Positive	14	8	2

CONCLUSIONS

The loop and whorl fingerprint patterns were most common among non-cooperative and cooperative children, respectively, in our investigation. None of the participants in the study met Frankel's definitely positive rating. According to Frankl's behavior rating scale, children with loop patterns of fingerprints were rated as definitely negative, while those with whorls patterns were rated as positively cooperative.

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