ORIGINAL RESEARCH

Association of Dermatoglyphics with Children's Behavior during Extraction under Local Anesthesia: A Cross-sectional Pilot Study

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Abstract

Aim: The present study aimed to investigate the association of fingerprint patterns with the behavior of the child during extraction under local anesthesia.

Materials and methods: The study was conducted among 50 children aged 4–9 years old. After getting informed consent from their parents, the extraction of primary mandibular molars was carried out under local anesthesia. The behavior of the children was noted during the extraction process. In the subsequent stage, the fingerprint was collected by placing the right and left thumb on the ink stamp followed by the impression on a white sheet. The thumbprint impression was categorized based on the types of fingerprint patterns and it was statistically analyzed. The Chi-squared test was done to find the association of fingerprints with behavior.

Results: The left thumbprint showed 10 arch patterns, 24 loop patterns, and 16 whorl patterns, and the right thumbprint showed four arch patterns, 26 loop patterns, and 20 whorl patterns. The majority of the children with loop patterns showed Frankl's positive behavior, however, there was no significant relation between fingerprint pattern and cooperation of the child.

Conclusion: There was no significant relationship between the fingerprint patterns and behavior of children aged 4–9 years during extraction under local anesthesia.

Clinical significance: Assessment of children based on their behavior is one of the most important skills for a pediatric dentist. Fingerprint patterns might aid in predicting the degree of cooperation by children during dental procedures. The identification of children's behavior might help in choosing the appropriate behavior management technique to deal with the children in the dental office.

Keywords: Behavior, Children, Fingerprints, Local anesthesia.

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Introduction

Dental apprehension can leave a profound brunt on daily life and is a significant barrier to receiving dental care as it would generate a deep-rooted fretfulness in the child to visit further schedule.[1]

Behavioral dentistry is an interdisciplinary science, with the objective of developing an understanding in a dentist about the relational social force that influences a patient's behavior. The establishment of practicing children's dentistry is the ability to lead them through their dental experiences. Successful pediatric dentistry depends not only on the dentist's technical skills but also on his ability to acquire and maintain a child's cooperation.[2]

A child's behavior in dental treatment is greatly affected by factors such as the child's age, the parent's behavior and anxiety, the level of education and even the parent's ideology, previous medical and dental experience, and personality factors, such as mood. In addition to environmental factors, genetic factors have an effect on individual behavior.[3] Undoubtedly, children reveal diverse behaviors when visiting the dentist, which arises from their characteristics. Some children never cooperate, while others are quiet and composed and cooperate with the dentist.

Frankl et al., in 1962, classified a child's behavior into four groups according to the child's attitude and cooperation or lack of cooperation during dental treatment. Frankl's behavior rating scale contains clearly defined items for observation. It is one of the most reliable tools developed for behavior rating of children in dental settings.[4]

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The term "fingerprint" predominantly means an impression of the epidermal ridges of the fleshy distal portion of a finger formed by applying ink and pressing the finger on paper and is used as a means of establishing identity.[5] Dermatoglyphics is the analysis of fingerprints. The term dermatoglyphics (dermi = skin and glyphe = curve) was coined by Cummins and Midlo in 1926. Dermal ridges start to appear during the 12th week of

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intrauterine life and are completed by the 24th week of intrauterine life. These patterns are genetically determined and once formed, remain constant for a lifetime, except in overall size.[6]

Fingerprint patterns have been established as a genetic characteristic that is unique and can be used for identity recognition.[7] Fingerprint patterns are categorized as arch, loop, or whorl types (Fig. 1).

Singh and Majumdar organized a study in genetics and biology indicating that fingerprints can help to understand behavioral characteristics, talents, skills, and personality traits.[8] Shrestha et al. described that individuals with loop fingerprint patterns tend to be shy, while those with whorl fingerprints have a stable personality and tend not to change their beliefs. Individuals with arch fingerprints tend to be less sociable and do not like to live in groups.[9] Prabhu et al. studied the relationship between fingerprints and oral and dental diseases.[10] Mokhtari et al. used fingerprints as a tool for investigating a child's behavior in the dental office.[11]

In pediatric dentistry, behavior management, and the children's cooperation are decisive to the accomplishment of any dental treatments. Familiarity with children's behavioral characteristics and the ability to predict their behavior in different situations can determine the success of dental therapy and visits, especially during the first visit.[12]

Hence, this study aims to assess the behavior of children during their extraction under local anesthesia using Frankl's behavior rating scale and its association with fingerprints.

Materials and Methods

A total of 50 children reporting to the Department of Pedodontics and Preventive Dentistry, Vivekanandha Dental College for Women, Tiruchengode, Tamil Nadu, India were selected for this pilot study. The study was conducted among 50 children aged 4–9 years old. The inclusion criteria consisted of age 4–9 years, consent to participate in the study, general health, no medical, congenital, psychological, and mental disorders, no history of penetrating trauma or burning that might have changed the dermatoglyphic pattern, the presence of carious primary mandibular molars requiring extractions under local anesthesia, and no previous dental experience/treatment.

The children who met the inclusion criteria entered the second session of treatment after completing the first session of oral and dental examination. After getting informed consent from their parents, the chief examiner administered a standard inferior alveolar nerve block, using 2 mL of 2% lidocaine plus 1:80,000 adrenaline (Lignox 2% A). Then the extraction of primary mandibular molars was carried out.

Another postgraduate student of pediatric dentistry was asked to assess the children's behavior during the extraction process. The Frankl behavior rating scale was used for this purpose (Table 1).[4] The therapist noted children as having + or ++ degree of cooperation as being cooperative, while those with – – or – were deemed uncooperative.

In the subsequent stage, the thumbprints from the children were collected by placing the right and left thumb on the ink stamp followed by the impression on a white sheet. Recognition and classification of the fingerprints were performed based on standard classifications by a skilled dentist separately and blindly.[5] The skilled dentist classified the fingerprint patterns twice for each subject. If there was a difference between the results, it was checked and classified by another blinded, trained, and calibrated dentist, and the classification was repeated.

The data were equated in Statistical Package for the Social Sciences 20 using the Chi-squared test in terms of the most common fingerprint type in the cooperative and uncooperative groups. The significance level was considered to be ($p < 0.05$).

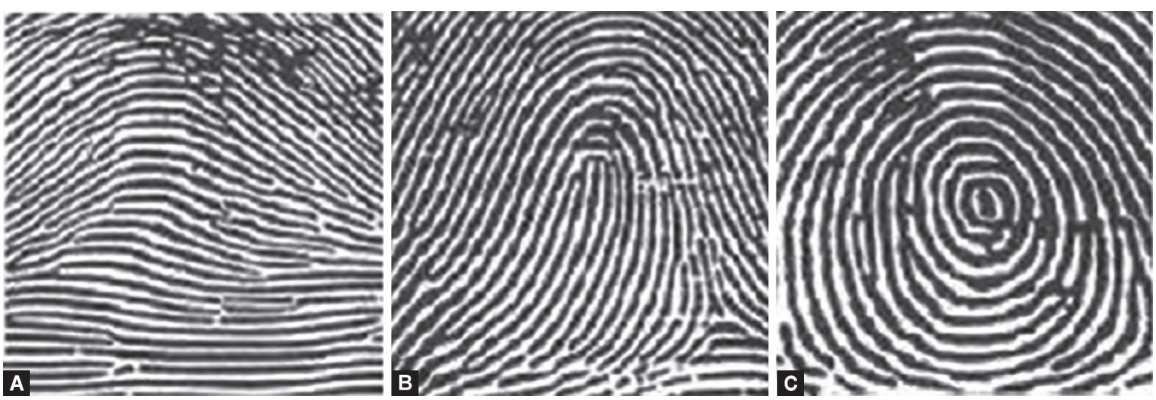
Results

A total of 50 children participated in this pilot study, aged 4–9 years with a mean age of 6.5 years amongst 16 were males, and 34 were females. 44 were cooperative and only 6 were uncooperative amidst 50 children. There was no statistically significant difference between groups in age and gender (Table 2).

Table 3 illustrates that among the left and right thumbprints of 50 children, the left thumbprints includes 10 arch patterns (all 10 shows positive behavior), 24 loop pattern (22 shows positive behavior and only two shows negative behavior), and 16 of whorl

Table 1: Frankl's behavior rating scale

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, and some evidence of negative behavior but not considerable (bad temper and isolation)
Positive	Accepting the treatment while being careful, the tendency to agree with the dentist, and the child cooperates with the dentist conditionally
Definitely positive	The child will communicate with the dentist, is interested in dental procedures, laughs, and enjoys the treatment



Figs 1A to C: Fingerprint patterns: (A) Arch; (B) Loop; (C) Whorl

pattern (12 shows positive and four showed negative behavior) whereas right thumbprints include four arches (four showed positive behavior), 26 of loop pattern (24 positives and two showed negative behavior) and 20 of whorl pattern (16 showed positive and four showed negative behavior).

Table 4 shows that there was no statistical significant difference between the groups of fingerprint patterns and the behavior of the children. The current findings revealed the association between fingerprint patterns and children's behavior during extraction was not significant.

Discussion

Behavioral pedodontics is the study of science that helps to understand the development of fear, anxiety, anger, and associated acts as it applies to the child in the dental situation.[13] Predicting a child's likelihood of behavior 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. This might also help in selecting the proper behavior management technique during dental treatment. Frankl's behavior rating scale is a valuable tool for qualitatively categorizing a child's behavior.[4]

Dermatoglyphic patterns are unique to each person and do not change once developed. Dermatoglyphic patterns have been considered as a health marker that can be used to predict a child's genetic disorders like Down syndrome, Turner syndrome, Klinefelter syndrome, congenital malformations, etc.[14] Personality and individual behavior are indefinite and unidentified. Humans exhibit diverse behaviors in different conditions. Fingerprints can bring insight into an individual's emotions, motivations, and performance in specific situations.[8] Fingerprint patterns might help to predict the extent of cooperation by children during dental procedures. Generally, fingerprint patterns are categorized as loop, Whorl, or arch patterns, accounting for 60–65%, 30–35%, and 5% of all fingerprints, respectively.[7]

The findings of the present study revealed that fingerprint patterns are not similar in the two hands of all the subjects, similar to the study done by Kazemi et al. who compared fingerprints between patients with autism and normal individuals in Iran.[15] Children with the arch pattern was comparatively lesser than the whorl and loop patterns but none of the child with the arch pattern exhibited negative behavior. Children with loop patterns were more in number and also exhibited increased cooperative behavior.

Campbell in his textbook on fingerprints and behavioral correspondences stated that individuals with arch-type fingerprints wish a modest lifestyle and like to communicate with others. This group of individuals competently perform what they have learned. Individuals with loop fingerprint type express their emotions easily and adapt to the environment. Those with the whorl fingerprint type tend to have strong personalities and high intelligence and possess high cognitive power.[16]

DP et al.[17] studied the relation between distinct fingerprint patterns and Frankl's behavior rating scale using digital scanners in children aged 6 to 12 years and concluded that children with a loop pattern fingerprint were negative and children with whorl patterns were positive which was contradictory to the present study where children with loop pattern exhibited increased positive behavior recorded using ink stamp pad method in the age-group of 4–9 years old.

Mokhtari et al.[11] investigated the relation between fingerprint type and children's behavior, in the age group of 3–6 years and concluded that noncooperative subjects had the whorl fingerprint patterns, and cooperative participants had loop fingerprint patterns which are similar to the present study but the former was assessed using digital scanners while the latter done with ink stamp pad method.

In addition to studies on the relationship between personal behavioral characteristics and fingerprints, some investigations have examined the relationship between fingerprint types and autistic patients, malocclusion, and dental caries. Kazemi et al. also observed more loops in the fingerprints of patients with autism than those without autism, suggesting that fingerprints could be one factor when screening children for autism.[15]

Jindal et al.[18] utilized the ink and roller method to correlate the relation between dermatoglyphics and malocclusion and revealed that dermatoglyphics could be an effective early indication of malocclusion. Chinmaya et al.[19] studied that an individual's dental caries experience was linked to their fingerprint, and dermatoglyphics could be used as a sign of dental caries.

Atasu et al.[20] 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 et al.,[21] the likelihood of dental caries increases with whorl

Table 2: Comparison of age and gender between children among groups

		Positive	*Negative*	*p-value*
Age (4–9 years)		44 (88%)	6 (12%)	0.09
Gender	Male	12 (24%)	4 (8%)	0.11
	Female	32 (64%)	2 (4%)	

Table 4: Association of fingerprints with behavior

		Negative	*Positive*	*p-value*
Left	Arch	0	10 (20%)	0.09
	Loop	2 (4%)	22 (44%)	0.36
	Whorl	4 (8%)	12 (24%)	0.21
Right	Arch	0	4 (8%)	0.06
	Loop	2 (4%)	24 (48%)	0.29
	Whorl	4 (8%)	16 (32%)	0.20

Table 3: Descriptive statistics of fingerprint patterns of both right and left thumb

	Left thumb—positive	*Left thumb—negative*	*Right thumb—positive*	*Right thumb—negative*
Pattern	*N* (%)	*N* (%)	*N* (%)	*N* (%)
Arch	10 (20%)	0	4 (8%)	0
Loop	22 (44%)	2 (4%)	24 (48%)	2 (4%)
Whorl	12 (24%)	4 (8%)	16 (32%)	4 (8%)

pattern incidence and decreases with loop pattern fingerprint. Tikare et al.[22] revealed that dermatoglyphics could be a valuable tool in treating malocclusion. Vaidya et al.[23] concluded that dermatoglyphics leads to the early detection of genetic abnormalities of the oral cavity.

The limitations of our study include, recording fingerprints was supposed to be a pleasant play for most of the subjects, however, it would cause some stress for some children, affecting their behavior. Also, to have a high-quality fingerprint screen, repetitive recording was sometimes necessary to assess the fingerprint patterns. Since, dermatoglyphics is still not a very consistent method in contemporary times, further research and studies in this field are required to define and evaluate the implication of fingerprint patterns with the behavior of children in the larger population. So the dentists can decide on the behavior management techniques based on the behavior of the children.

Conclusion

Based on the observations of this study and results obtained through statistical analysis, the loop pattern was observed in many children who exhibited more positive behavior than the whorl pattern. The arch pattern was also observed as few in number but all the subjects showed positive behavior. The relationship was not significant between the fingerprint patterns and behavior of children aged 4–9 years during extraction.

References

1. Sivakumar P, Gurunathan D. Behavior of children toward various dental procedures. Int J Clin Pediatr Dent 2019;12(5):379–384. DOI: 10.5005/jp-journals-10005-1670
2. Sharath A, Rekka P, Muthu MS, et al. Children's behavior pattern and behavior management techniques used in a structured postgraduate dental program. J Indian Soc Pedod Prev Dent 2009;27(1):22–26. DOI: 10.4103/0970-4388.50812
3. Hetherington EM, Parke RD. Child psychology: a contemporary viewpoint. 5th ed. Boston: McGraw-Hill; 1999.
4. Frankl S, Shiere F, Fogels H. Should the parent remain with the child in the dental operatory? J Dent Child 1962;29:150–163.
5. Navit S, Pramanik S, Khan SA, et al. Cheiloscopy and dactyloscopy as behavior assessment tool in dental settings: a cross-sectional study. Int J Clin Pediatr Dent 2021;14(2):238–242. DOI: 10.5005/jp-journals-10005-1910
6. Cummins H, Midlo C. Palmar and plantar epidermal ridge configurations (dermatoglyphics†) in European-Americans. Am J Phy Anthrop 1926;179:741–802. DOI: 10.1002/ajpa.1330090422
7. Agarwal KK, Dutt HK, Saxena A, et al. General assumption of psychological behavior based on finger print pattern. J Biol Life Sci 2012;3(1):2157–6076. DOI: 10.5296/jbls.v3i1.1499
8. Singh M, Majumdar O. Dermatoglyphics: blueprints of human cognition on fingerprints. Int J Comput Sci Commun 2015;6(2):124–146. DOI: 10.090592/IJCSC.2015.608
9. Shrestha D, Gupta VP, Chaurasiya PS, et al. Study of correlation between different fingerprint patterns, blood groups, and social behavior among medical students (Nepalese citizens). Pac J Sci Technol 2016;17(2):288–292.
10. Prabhu N, Issrani R, Mathur S, et al. Dermatoglyphics in health and oral diseases-a review. JSM Dent 2014;2(4):1044.
11. Mokhtari S, Mokhtari S, Salehi Shahrabi M. Fingerprints as an index for investigating cooperation by children in dentistry: a pilot study. Eur Arch Paediatr Dent 2021;22(2):203–207. DOI: 10.1007/s40368-020-00570-6
12. Salehi Shahrabi M, Shahrabi M, Heidari A, et al. Role of attachment style in prediction of behavior of 3 to 6-year-old children. Eur Arch Paediatr Dent 2020;21(6):647–656. DOI: 10.1007/s40368-019-00495-9
13. Marwah N. Textbook of Pediatric Dentistry. 3rd ed. New Delhi: Jaypee Brothers Medical Publishers (P) Ltd; 2014. pp. 219–220.
14. Deepa UT, Arasan DG. Dermatoglyphics pattern in children with congenital malformations. Int J Contemp Pediatr 2018;5(3):749–753. DOI: http://dx.doi.org/10.18203/2349-3291.ijcp20181444
15. Kazemi M, Fayyazi-Bordbar MR, Mahdavi-Shahri N. Comparative dermatoglyphic study between autistic patients and normal people in Iran. Iran J Med Sci 2017;42(4):392–396. PMID: 28761206.
16. Campbell E. Fingerprints and behavior: a text on fingerprints and behavioral corespondences: volume 1. New York: Amida Biometrics LLC;2012.
17. DP SK, Ahire SM, Mulchandani V, et al. Is there is a link between dermatoglyphics and the Frankl behaviour rating scale in the paediatric dental setting: a pilot study. Contemp Pediatr Dent 2022;3(2):73–79. DOI: 10.51463/cpd.2022.105
18. Jindal G, Pandey RK, Gupta S, et al. A comparative evaluation of dermatoglyphics in different classes of malocclusion. Saudi Dent J 2015;27(2):88–92. DOI: 10.1016/j.sdentj.2014.11.012
19. Chinmaya BR, Smitha BV, Tandon S, et al. Dermatoglyphics: an indicator of dental caries in humans. J Indian Assoc Public Health Dent 2016;14:272–275. DOI: 10.4103/2319-5932.187175
20. Atasu M, Kuru B, Firatli E, et al. Dermatoglyphic findings in periodontal diseases. Int J Anthropol 2005;20:63–75. DOI: 10.1007/BF02445214
21. Saxena A, Pradhan D, Pruthi N. Dermatoglyphics and dental caries: a correlation study among school children of Kanpur City, India. Rama Univ J Dent Sci 2016;3(4):1–6.
22. Tikare S, Rajesh G, Prasad KW, et al. Dermatoglyphics–a marker for malocclusion? Int Dent J 2010;60(4):300–304. PMID: 20949762.
23. Vaidya P, Mahale S, Badade P, et al. Dermatoglyphics in periodontics: an assessment of the relationship between fingerprints and periodontal status - A cross-sectional observation study. Indian J Dent Res 2017;28(6):637–641. DOI: 10.4103/ijdr.IJDR_621_16