Impact of Music Distraction on Dental Anxiety in Children Having Intellectual Disability

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Abstract

Aim and objective: To analyze the impact of Indian instrumental music on children with intellectual disability (mild) exhibiting dental anxiety during dental procedures using electrical skin resistance measured by a biofeedback machine.

Materials and methods: A total of 20 children of 6–14 years having an intellectual disability (mild) were randomly divided into two groups comprising of 10 each. The study was carried out in a cross-over design, with and without music distraction in two appointments spaced out at a gap of 1 month. The children were subjected to a dental examination, oral prophylaxis, and auditory operative stimuli in both appointments. The electrical skin resistance during each procedure was measured using a galvanic skin response (GSR) biofeedback machine and the values were statistically analyzed using paired and unpaired t-tests.

Results: A statistically significant increase in electrical resistance was observed during music distraction, which indicated an anxiety reduction when music distraction was employed.

Conclusion: The increased electrical skin resistance due to low anxiety proves the positive impact of music distraction in intellectually disabled children.

Clinical significance: Music can be employed as a distraction technique to reduce anxiety in intellectually disabled children.

Keywords: Dental anxiety, Electrodermal activity, Galvanic skin response, Intellectual disability, Music distraction.

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Introduction

Fear and anxiety are said to be the most challenging aspects in pediatric dental practice which cause avoidance of dental care that eventually leads to compromised oral health. It has been reported in the literature that dental setting and dental treatment are the fifth most common cause of anxiety leading to uncooperative behavior which can be managed by pharmacological/nonpharmacological methods of behavior management. Children with intellectual disabilities exhibit greater anxiety due to cognitive impairment making behavior management more difficult due to the problems encountered during communication with the child.

Music distraction has been extensively tried in healthy children and is proved effective. The studies in special children employing the above technique are limited; however, Davila and Menendez have suggested the possibility of employing techniques like a distraction in the mild intellectually disabled group.³ Various subjective and objective measures have been highlighted in literature for quantifying anxiety based on the child’s age and intellectual development among which electrodermal activity (EDA) is said to have a high degree of sensitivity when compared to other physiological measures.³ It is based on the principle that, in the presence of emotional stimuli, the sweat secretion is altered as a result of which changes are produced in the electrical activity of the skin.⁴

The present study was an effort to assess the effectiveness of instrumental music as a distraction technique in mild intellectually disabled children by measuring the EDA of the skin.

Materials and Methods

Twenty children with mild intellectual disability (having an I.Q. score between 50 and 69) aged between 6 years and 14 years of both genders reporting to NITTE Special Child Care Centre (NSPECC), a unit of Department of Pediatric and Preventive Dentistry, AB Shetty Memorial Institute of Dental Sciences, NITTE (Deemed to be University) were selected by convenience sampling for the study. Ethical clearance was obtained from the Institutional Ethical Committee and informed consent was obtained from the parents/guardian of the special children.

Inclusion Criteria

• Children with mild intellectual disability as specified by the Diagnostic and Statistical Manual of Mental Disorders–V (DSM-V) classification given by the American Psychiatric Association.⁵
• Hearing acuity within normal limits.

Exclusion Criteria

• Children under anti-anxiety medication and anti-cholinergic medication.

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Conflict of interest: None
The present study was aimed to evaluate the changes in EDA associated with dental anxiety in children with mild intellectual disability aged between 6 years and 14 years during dental procedures with and without music distraction.

The baseline GSR values were obtained for both groups in both appointments. At baseline, group I was found to have a GSR value of $255.93 \pm 204.998$ in the first visit and $133.83 \pm 93.889$ in the second visit. Group II was found to have a GSR value of $99.63 \pm 57.019$ in the first visit and $268.13 \pm 126.617$ in the second visit.

During the dental examination, the intragroup comparison showed that in group I, the mean GSR values were found to be $318.89 \pm 204.998$ in the first appointment (with music distraction) and $133.93 \pm 77.074$ in the second appointment (without music distraction). In group II, the mean GSR values were found to be $144.93 \pm 54.589$ in the first appointment (without music distraction).
distraction) and 329.76 ± 195.024 in the second appointment (with music distraction). Both the paired t-test values were found to be statistically significant. On intergroup comparison, during dental examination in the first appointment in group I (with music distraction) and group II (without music distraction) the GSR values were 318.89 ± 204.998 and 144.93 ± 54.589, respectively. In the intergroup comparison of the second appointment during a dental examination, the mean GSR values were found to be 133.93 ± 77.074 in group I (without music distraction) and 329.76 ± 195.024 in group II (with music distraction). Both the unpaired t-test values were statistically significant (Table 1).

The intragroup comparison during oral prophylaxis showed that in group I, the mean GSR values were found to be 369.43 ± 216.519 in the first appointment (with music distraction) and 149.73 ± 68.996 in the second appointment (without music distraction). Whereas in group II, the mean GSR values were found to be 143.43 ± 84.244 in the first appointment (without music distraction) and 417.96 ± 194.142 in the second appointment (with music distraction). Both the paired t-test values were statistically significant. In the intergroup comparison in the first appointment during oral prophylaxis, the mean GSR values were found to be 369.43 ± 216.519 in group I (with music distraction) and 143.43 ± 84.244 in group II (without music distraction). In the second appointment during oral prophylaxis, the mean GSR values were found to be 149.73 ± 68.996 in group I (without music distraction) and 417.96 ± 194.142 in group II (with music distraction). Both the unpaired t-test values were statistically significant (Table 2).

The intragroup comparison of GSR values during operative stimuli (auditory) in group I, were found to be 415.99 ± 243.427 in the first appointment (with music distraction) and 142.09 ± 69.700 in the second appointment (without music distraction). In group II, the mean GSR values were found to be 163.23 ± 131.530 in the first appointment (without music distraction) and 468.63 ± 234.707 in the second appointment (with music distraction). Both the paired t-test values were statistically significant. Intergroup comparison revealed that the mean GSR values during operative stimuli (auditory) in the first appointment in group I (with music distraction) and group II (without music distraction) were 415.99 ± 243.427 and 163.23 ± 131.530, respectively. In the second appointment, the mean GSR values were found to be 142.09 ± 69.700 in group I (without music distraction) and 468.63 ± 234.707 in group II (with music distraction) (Table 3).

**Discussion**

Nonpharmacological methods of behavior management are preferred over pharmacological methods as they are relatively simple, economical, and feasible. However, in children with cognitive impairment, nonpharmacological methods are ineffective making pharmacological methods (in particular general anesthesia) a preferred method of management. The disadvantages however are increased treatment cost, intake of medication, and hospital admission. Since children with intellectual disabilities have been found to have a liking for music, it can be considered as an option to manage dental anxiety in special children.7

Literature states that excitatory music increases anxiety whereas calming, non-lyrical, low tone, wind, and string instruments produce a soothing effect during dental treatment for patients.8–10 The easy availability and the cultural acceptance of Indian instrumental music make it the best option for our study. It has been reported that the choice of music if given to the children would result in better control over the unpleasant stimulus (dental procedure).11 But since our study subjects were intellectually disabled, the decision-making could not be done by them due to which, the same Indian instrumental music was applied to all study subjects of the current study.

The effectiveness of any behavior management is determined by measuring anxiety levels. Anxiety levels measured using physiological parameters are preferred in children with intellectual disabilities over self-reported measures of anxiety.5 Several physiological parameters such as blood pressure, heart rate, pulse rate, oxygen saturation, salivary cortisol levels, skin conductance,
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The current study was carried out on 20 intellectually disabled children aged between 6 years and 14 years who were subjected to dental examination. This result is in agreement with the study done by Davila et al. in which music was successful in reducing anxiety in intellectually disabled children. Aitken et al. were contradictory to the results of our current study as they stated that the presence or absence of music distraction displayed no difference in anxiety levels during a restorative procedure. The statistically significant reduction in the anxiety levels noted during oral prophylaxis when music distraction was employed was contradictory to the observations of the study done by Chaturvedi et al. where audio-visual distraction did not affect dental anxiety.

On application of music distraction during auditory operative stimuli, the lower levels of anxiety noted are in accordance with the findings of the study done by Chaturvedi et al. and Marwah et al. who highlighted the success of music distraction when applied during dental procedures in healthy children. The findings of Aitken et al. were contradictory to the results of our current study as they stated that the presence or absence of music distraction displayed no difference in anxiety levels during a restorative procedure. The significant reduction of anxiety in our study when music distraction was used proves that music masks the auditory anxiety-provoking stimuli.

The above-discussed observations of our study prove that Indian instrumental music was effective in reducing dental anxiety in intellectually disabled children during dental procedures. The use of EDA as a physiological measure was also a success which paves way for future utilization of the same in studies involving special children.

**Limitations of the Study**

- Further studies employing invasive dental procedures are also required to validate the effectiveness of music distraction in reducing anxiety during those procedures.
- Further studies are warranted to understand the duration for which the relaxation provided by music persists.

**Table 1: Comparison of galvanic skin response levels during dental examination**

| Group | Appointment | n | Mean | SD   | Paired t-test | Unpaired t-test |
|-------|-------------|---|------|------|---------------|-----------------|
| Group I | 1           | 10 | 318.89 | 204.998 | $t = 3.095, p = 0.013$ | $t = 3.041, p = 0.007$ |
|        | 2           | 10 | 133.93 | 77.074  | $t = 3.076, p = 0.006$ | $t = 3.041, p = 0.007$ |
| Group II | 1          | 10 | 144.93 | 54.589  | $t = -3.827, p = 0.004$ | $t = -2.953, p = 0.008$ |
|        | 2           | 10 | 329.76 | 195.024 | $t = -4.117, p = 0.001$ | $t = -4.117, p = 0.001$ |

*p value ≤ 0.05 is significant, p value > 0.05 is not significant*

**Table 2: Comparison of galvanic skin response levels during oral prophylaxis**

| Group | Appointment | n | Mean | SD   | Paired t-test | Unpaired t-test |
|-------|-------------|---|------|------|---------------|-----------------|
| Group I | 1           | 10 | 369.43 | 216.519 | $t = 3.532, p = 0.006$ | $t = 3.076, p = 0.006$ |
|        | 2           | 10 | 149.73 | 68.996  | $t = -6.194, p = 0.000$ | $t = -4.117, p = 0.001$ |
| Group II | 1          | 10 | 143.43 | 84.244  | $t = -6.003, p = 0.000$ | $t = -4.217, p = 0.000$ |
|        | 2           | 10 | 417.96 | 194.142 | $t = 4.305, p = 0.002$ | $t = 2.889, p = 0.009$ |

*p value ≤ 0.05 is significant, p value > 0.05 is not significant*
**FUTURE RECOMMENDATIONS**

- The music employed in the present study was Indian instrumental music which is indigenous to our study population. There is scope for future research in other forms of instrumental music for intellectually disabled children.
- A comparison between the effects of music distraction between healthy children and children with intellectual disabilities would help us understand the biological basis of music distraction.
- Effects of individualized interventions like employing favorite music of the individual/specially composed music should be analyzed further. The impact of age, gender, and ethnicity on music distraction also need to be explored.
- The difference in EDA between different age groups of healthy and special children needs to be evaluated.

**CONCLUSION**

Music proves to be a useful nonpharmacological intervention for anxiety management that is noninvasive with relatively no side effects. The significant advantage is that it can also be coupled with other forms of behavior management techniques without any risk of adverse effects. The following conclusions were drawn based on the results of the present study:

- Music distraction using Indian instrumental music was effective in reducing the anxiety levels in children with mild intellectual disability during all three procedures.
- The reduction in anxiety levels was comparable during all three procedures.
- The EDA, i.e., electrical skin resistance that was assessed in this study was found to be higher (indicating lower anxiety levels) when music distraction was used and the difference was found to be statistically significant.

**REFERENCES**

1. Appukuttan DP. Strategies to manage patients with dental anxiety and dental phobia: literature review. Clin Cosmet Investig Dent 2016;8:35–50. DOI: 10.2147/CCIDE.S63626.
2. Davila JM, Menendez J. Relaxing effects of music in dentistry for mentally handicapped patients. Spec Care Dent 1986;1:18–20. DOI: 10.1111/j.1754-4505.1986.tb00943.x.
3. Jimeno FG, Bielsa SY, Fernández CC, et al. Objective and subjective measures for assessing anxiety in pediatric dental patients. Eur J Pediatr Dent 2011;12(4):239–244.
4. Kolodziej M, Tarnowski P, Majkowski A, et al. Electrodermal activity for emotional arousal. Bull Pol Ac Tech 2019;67(4):813–826.
5. American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed., Washington, DC: American Psychiatric Association; 2013.
6. Najafpour E, Aminabadi NA, Nuroloyuni S, et al. Can galvanic skin conductance be used as an objective indicator of children’s anxiety in the dental setting? J Clin Exp Dent 2017;9(3):377–383.
7. Vance WC, Toombs S. A procedure for determining the music preferences of mental retardates. J Music Ther 1966;3(2):57–64. DOI: 10.1093/jmt/3.2.57.
8. Kaempf G, Margaret E, Amodei RN. The effect of music on anxiety. AORN J 1989;50(1):112–118. DOI: 10.1016/s0001-2092/07/67642-x.
9. Nilsson U. The anxiety and pain reducing effects of music interventions: a systematic review. AORN J 2008;87(4):780–807. DOI: 10.1016/j.aorn.2007.09.013.
10. Zimny GH, Weidenfeller EW. Effects of music upon GSR of children. Child Dev 1962;33(4):891–896. DOI: 10.2307/1126899.
11. Chaturvedi S, Walmbe H, Karekar P, et al. Comparative evaluation of anxiety level during the conventional dental procedures with and without the audiovisual distraction eyeglasses in pediatric dental patients. J Int Oral Health 2016;8(11):1016–1022.
12. Rayen R, Muthu MS, Chandrasekhar Rao R, et al. Evaluation of physiological and behavioural measures in relation to dental anxiety during sequential dental visits in children. Indian J Dent Res 2006;17(1):27–34. DOI: 10.4103/0970-9290.29895.
13. Dedeepya P, Nuvvula S, Kamatham R, et al. Behavioural and physiological outcomes of biofeedback therapy on dental anxiety of children undergoing restorations: a randomized controlled trial. Eur Arch Pediatr Dent 2013;15(2):97–103. DOI: 10.1007/s40368-013-0070-3.
14. Shah HA, Swamy KV, Kulkarni S, et al. Evaluation of dental anxiety and hemodynamic changes (Sympthao-adrenal response) during various dental procedures using smartphone applications v/s traditional behavior management techniques in pediatric patients. Int J Appl Res 2017;3(5):429–433.
15. Shetty V, Suresh LR, Hegde AM. Effect of virtual reality distraction on pain and anxiety during dental treatment in 5–8 year old children. J ClinPediatr Dent 2019;43(2):97–102.
16. Ferguson BJ, Hamlin T, Lantz JF, et al. Examining the association between electrodermal activity and problem behavior in severe autism spectrum disorder: A feasibility study. Front Psychiatry 2019;10(654):1–8. DOI: 10.3389/fpsyt.2019.00654.
17. Marwah N, Prabhakar AR, Raju OS. Music distraction: its efficacy in management of anxious pediatric dental patients. Indian Soc Pedod Prev Dent 2005;23(4):168–170. DOI: 10.4103/0970-4388.19003.
18. Atiken JC, Wilson S, Coury D, et al. The effect of music distraction on pain, anxiety and behavior in pediatric dental patients. Pediatr Dent 2002;24(2):114–118.