

Comparing Two Types of Distraction (Passive and Active) During Primary Mandibular Molar Pulpotomy (Randomized Controlled Trial)

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Abstract

Objectives: The aim of this study was to compare the types of passive distraction - by watching cartoons - and active distraction - by video games - during pulpotomy on the primary mandibular molars in children.

Materials and Methods: The research sample consisted of 70 children who were randomly divided into two groups according to the distraction method used:

Group (1): 35 children who used the active distraction technique by video games through a wireless gaming handpiece.

Group (2): 35 children who used the passive distraction technique by watching cartoons films.

Children were selected from the Department of Pediatric Dentistry at the Faculty of Dentistry - Damascus University, who needed pulpotomy in primary mandibular molar. All children were assessed using: the modified Wong-Baker Faces Scale as a self-report, and the 'HOUP' for crying scale as a non-self-report, and assessment was conducted first after the anesthesia injection and the second time after completion of the treatment.

Results: The (One Way-Anova) test was conducted to evaluate differences between two groups, Active distraction was superior in reducing fear and anxiety by HOUP scale for crying after local anesthesia $P = (0.001)$ and no statistically significant differences in the end of treatment. for the Wong-Baker faces scale active distraction was superior in reducing fear and anxiety after the local anesthesia and at the end of the treatment, $P = (0.000)$. Thus, active distraction was superior in reducing fear and anxiety during the pulpotomy procedure in children .

Conclusion: Passive and active distraction techniques are successful and effective during dental procedures in children, with the superiority of active distraction by video games in reducing fear and anxiety in children.

Keywords: Active distraction - Passive distraction- Dental fear and anxiety - Behavior management.

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مقارنة نوعي تشتيت الانتباه (المنفعل والفعال) أثناء إجراء بتر اللب على الأرحاء السفلية المؤقتة عند الأطفال (دراسة سريرية)

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المخلص:

الهدف: كان الهدف من هذه الدراسة مقارنة أنواع تشتيت الانتباه المنفعل-بواسطة أفلام الفيديو- والفعال-بواسطة ألعاب الفيديو- أثناء إجراء بتر اللب على الأرحاء السفلية المؤقتة عند الأطفال. **المواد والطرائق:** تألفت عينة البحث من 70 طفلاً قسموا عشوائياً إلى مجموعتين متساويتين وفقاً لطريقة التشتيت المستخدمة:

المجموعة الأولى: 35 طفلاً تم استخدام تقنية تشتيت الانتباه الفعال بواسطة ألعاب الفيديو عبر قبضة لاسلكية.

المجموعة الثانية: 35 طفلاً تم استخدام تقنية تشتيت الانتباه المنفعل بواسطة أفلام الفيديو عبر جهاز لوجي. تم اختيار الأطفال من قسم طب أسنان الأطفال في كلية طب الأسنان - جامعة دمشق ، من هم بحاجة إلى إجراء بتر لب على إحدى الأرحاء السفلية المؤقتة، تم المعالجة، وتم تقييم جميع الأطفال من خلال: مقياس الوجوه التعبيرية Wong-Baker المعدل كمقياس ذاتي، ومقياس "HOUP" للبيكاء كمقياس غير ذاتي، تم إجراء التقييم مرتين الأولى بعد إجراء حقنة التخدير والثانية بعد الانتهاء من المعالجة.

النتائج: أتم الدراسة 70 طفلاً، تم إجراء اختبار (One Way-Anova) لدراسة الفروق بين المجموعتين، لوحظ وجود فروق إحصائية بين مجموعة تشتيت الانتباه الفعال والمنفعل في مقياس HOUP للبيكاء بعد إجراء التخدير الناحي حيث بلغت قيمة $P=(0.001)$ ولم يلاحظ فروق دالة بعد ذلك حتى نهاية المعالجة، أما بالنسبة لمقياس الوجوه التعبيرية لوحظ وجود فروق دالة إحصائية بعد إجراء التخدير الناحي وحتى الانتهاء من المعالجة حيث بلغت $P=(0.000)$ ، وبذلك تفوق تشتيت الانتباه الفعال في تقليل الخوف والقلق أثناء إجراء بتر اللب عند الأطفال.

الاستنتاج: تعتبر تقنيتي تشتيت الانتباه المنفعل والفعال تقنية ناجحة وفعالة أثناء الإجراءات السنوية المؤلمة عند الأطفال مع تفوق تقنية تشتيت الانتباه الفعال بواسطة ألعاب الفيديو في تخفيف الخوف والقلق عند الأطفال

الكلمات المفتاحية: تشتيت الانتباه الفعال-تشتيت الانتباه المنفعل- الخوف والقلق السنوي - تدبير السلوك.

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Introduction :

Dental fear is defined as a negative reaction to specific stimuli associated with dental treatment, while dental anxiety is an excessive and unexpected negative emotional state experienced by patients (Cianetti et al., 2017). Dental anxiety is common, with a prevalence of 6-20% among children between the ages of 4 and 18 (Klingberg & Broberg, 2007). This rate increased in 2019 to 6 to 42% (Prado et al., 2019)

Distraction is a non-traumatic technique that distracts the child's attention from the painful stimulus and allows for successful and high-quality treatment. (Al-Khotani et al., 2016)

Visual or auditory stimuli can be useful for behavior management, especially in patients who appear to be anxious in the dental chair. (Lahmann et al., 2008)

Distraction can be active or passive (negative or positive). Audiovisual distraction is a type of passive distraction that affects two types of senses: hearing and sight, while playing video games is a type of active distraction that affects an additional sense: motor sensation. (Allani & Setty, 2016)

Audiovisual distraction is a common method of pain relief during minor interventions, which includes distraction by watching television, virtual reality glasses, audiovisual glasses, and also listening to music, which in turn may distract the children from disturbing stimuli and make them more relaxed. (Prabhakar et al 2007 Sullivan et al 2000)

Active distraction relies on encouraging the child to participate in certain activities while performing painful procedures, including singing songs, squeezing a ball, taking deep breaths, and playing with electronic devices. (Srouji et al., 2010)

Aim of the study:

Comparison of the effectiveness of active distraction using electronic games on a wirelessly paired tablet with a gaming handpiece, and passive distraction using cartoon films on a tablet in reducing pain and anxiety during primary mandibular molar pulpotomy.

Materials and Methods:

Study design:

A randomized controlled clinical trial study comparing active distraction using video games via a gaming

handpiece wirelessly connected to a dental chair tablet and headphones and passive distraction using cartoon videos via tablet and wireless headphones.

Sample Description:

G-power 3.0.10 program was used and based on a similar previous study (Al-Halabi, 2018) with a significance level of 5% and a 95% confidence interval. The research sample consisted of 70 children from the Department of Pediatric Dentistry at the Faculty of Dentistry - Damascus University, who were randomly divided into two groups:

Group (1): 35 children who used the active distraction technique by video games through a wireless gaming handpiece. Figure (1)

Group (2): 35 children who used the passive distraction technique by watching cartoons films on a tablet.

Inclusion Criteria:

- The child must be 6-10 years old.
- Positive or indecisive according to the Salvioff-Tinawi classification.
- With no previous dental experience.
- Not suffering from any neurological disorders or general diseases.
- Needing treatment as pulpotomy on one of the primary mandibular molars.
- Didn't receive any sedatives or painkillers during the last three hours before the treatment

Exclusion criteria :

- Traumatic dental experience.
- Special needs children

Randomization and blinding:

The children were randomized based on the website www.randomization.com where the data was entered and a serial number was generated for each child in the sample, starting from number 1 to number 70.

The children were divided into two groups, each group containing 35 children, and pulpotomy was performed for each child according to their distribution.

Group 1: Positive active distraction group, video games were used on a tablet connected wirelessly with a gaming handpiece and wireless headphones. The tablet was equipped with a variety of games up to 10 games and the child was left free to choose the game he wanted.

Group 2: Passive distraction group, video movies were used via a tablet attached to the dental chair and wireless headphones.

The tablet was equipped with 6 of the most popular cartoon movies among children and left the child free to watch his favorite cartoon movie

The evaluation was conducted in two stages of the treatment: First: After regional anesthesia was performed as it is the most painful procedure for children, and Second: after the completion of the treatment, with the child being monitored during the entire treatment and noting any changes in behavior according to the scales used in the research: the HOUPPT crying scale, Table (1), and the modified Wong-Baker-Faces scale, Figure(1)

Table (1): Houpt Crying Scale.

Houpt Scale	
Score 1	Hysterical, Demanding attention
Score 2	persistent, constant, makes treatment difficult
Score 3	Intermittent, mild, does not interfere with treatment
Score 4	No crying

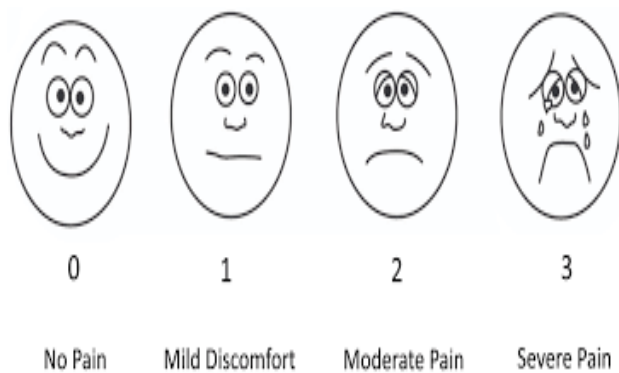


Figure 1: modified Wong-Baker-Faces scale

Methods:

The i-Pega PG-9078 Wireless Grip was used with a Samsung Galaxy Tab S 10.5 LTE tablet that supports installed video games from the game store, plays cartoon movies in mp4 format, and can be connected wirelessly via Bluetooth with the gaming handpiece and Bluetooth headset. The tablet was attached to the

upper arm of the dental chair via the Samsung Galaxy Tab S Book Cover.

The tablet is equipped with 10 of the most popular games and 6 of the most popular cartoon movies, leaving the child free to choose his favorite game or movie according to the group he belongs to.

Distraction was performed during the pulpotomy procedure from the moment the child sat on the dental chair until the completion of the treatment, where the children of the first group started playing for 5 minutes inspecting the game and the way of playing

and then starting the treatment, and the children of the second group chose the cartoon movie and started watching it for 5 minutes and then starting the treatment.

The behavior score was measured according to the Houpt scale (for crying) by three different evaluators who are specialists in pediatric dentistry and were trained on the scale used. The scale score was adopted when at least two evaluators agreed, and when the three evaluators differed in evaluating the behavior, the arithmetic mean between the scale scores was adopted, for each child in the sample and based on the recorded video that starts when the child sits on the dental chair and ends when the treatment is completed. Pulpotomy was performed according to the following steps: (Nguyen et al 2017).

- Application of topical gel (20% Benzocaine).
- Regional anesthesia with Spikes injection according to the instructions of (Wright and Kupietzky 2014).
- Preparing the tooth to receive a stainless-steel crown and selecting the appropriate crown.
- Applying the rubber dam to isolate the working area.
- Outlining of the cavity using diamond burs on a high-speed handpiece
- Complete curettage of the dental caries using curettage burs on a low-speed handpiece.
- Complete pulp chamber roof elevation after pulp exposure using a bur on a high-speed handpiece
- Coronal pulp removal using a ball bur on a low-speed handpiece
- A sterile cotton ball soaked in saline was placed over the pulp for 5 minutes to aid in hemostasis.
- A cotton ball soaked in formocresol was gently placed over the radicular pulp and a dry cotton ball was placed on top for 5 minutes.

-After stabilizing the superficial pulp layer, zinc oxide-eugenol cement was applied as a basal filling.
 -Glass ionomer cement was applied as a basal filling.

-After the initial hardening of the basal filling, the rubber dam was removed and the previously selected stainless steel crown was applied, followed by the removal of the excess cement using dental floss.

Table(2) :Randomization results

Group 1 (Active Distraction)	44 1 2 21 15 5 27 33 66 4669 70 22 20 23 8 32 64 40 37 36 50 12 42 6 57 60 19 35 9 61 67 18 41 11
Group 2 (Passive distraction)	13 10 38 56 31 43 39 25 68 63 52 58 34 7 17 3 29 54 47 48 53 49 14 51 30 4 26 16 59 28 65 24 62 55 45



Figure 2: Active distraction technique using electronic games via wireless gaming handpiece.



Figure 3: Passive distraction technique using video films

Table (3): Percentages of children selected for the distraction group for electronic games

Games included in the tablet in the study	percentage
Grand Theft Auto: Vice City	25%
Racing Fever: Moto	21%
Clash Of Clans	17%
Racing Fever	11%
Galaxy On Fire	7%
World Of Gunships	5%
Mario Super Bros.	5%
Asphalt Xtreme	4%
Table Top Racing: World Tour	3%
Sonic CD Classic	2%

The 6 most popular cartoon films among children were selected and the children chose the films randomly without any differences between males and females Table (4)

Results:

The research sample consisted of 70 children (56% males and 44% females).

The 10 most popular games among children were selected and the children chose the games randomly without any differences between males and females Table (3).

Table (4): Percentages of children selected for the group of active distraction of cartoon films

Cartoons included in the study	percentage
Tom & Jerry	37%
Masha and The Bear	25%
Gumball	13%
Ben 10	11%
SpongeBob SquarePants	10%
The Pink Panther	4%

The SPSS version24 program was used for the statistical analysis.

The One-Way Anova test was used to study the differences between the two group

Study of the differences in the Haupt Crying Scale between the two groups of the research sample:

The success rate of the video game group was 100% in the two work stages according to the crying scale compared to the video group, whose success rates ranged between 94.3% - 97.1%, where grade (1 - 2) of the crying scale was adopted as failure and grade (3 - 4) as success.

In order to study the differences in the crying scale between the two research groups in the two work stages, the One Way Anova test was used, and the results are shown in the following table:

Table (5): One-way analysis test to study the differences in the crying scale between the two research groups in the two study stages

Work stages	F value	P value	Significance differences
The first stage after anesthesia	7.493	0.001	The differences are statistically significant
Second stage at the end of The treatment	4.443	0.675	The differences are not statistically significant

Table 5 shows the following results:

There are statistically significant differences in the values of the crying scale between the two research sample groups at the stage of regional anesthesia, which indicates that the children in the video game group feel less pain from the anesthesia injection

expressed by crying, while we did not find statistically significant differences between the two research sample groups at the end of the treatment, which indicates the success of the two methods of distraction during pulpotomy procedures.

Studying the differences in the self-assessment scale between the two groups of the research sample:

The video game group had a 97.1% success rate in both phases of the work according to the Wong-Baker Faces Scale, compared to the video group, whose success rates ranged between (71.4% and 85.7%) A score of (2-3) of the Wong-Baker Faces Scale was considered a failure and a score of (0-1) was considered a success.

In order to study the differences in the expressive faces scale between the two research groups in the two phases of work, the one-way anova test was used and the results of this are shown in the following table:

Table (6): One-way analysis test to study the differences in the self-assessment scale between the two research groups in the two study stages

Work stages	F value	P value	Significance differences
The first stage after anesthesia	10.219	0.000	The differences are statistically significant
Second stage at the end of The treatment	8.374	0.000	The differences are statistically significant

The following results are evident from reading Table No. (6):

There is a statistically significant difference between the video game group and the video group after the end of the anesthesia and upon completion of the treatment. Thus, the children in the video game group showed better satisfaction and acceptance of the anesthesia injection and treatment procedures than the children in the control group in the two evaluation stages.

Discussion:

The active distraction method using video games via a portable tablet on the dental chair achieved 100% success, as the treatment was completed without any significant crying and with the satisfaction of most of the children in the sample according to the scales used in the research. Thus, the study method of distraction outperformed passive distraction in managing behavior during regional anesthesia until the end of treatment in children.

According to the results of this study, the use of video games via the wireless handpiece as an effective distraction method significantly improved anxiety reduction and improved children's behavior more than the traditional methods of behavior management (tell-show-do), thus we agree with several studies, including (Attar & Baghdadi, 2015) (Chaudhary et al., 2019). (Kumprasert & Prapansilp, 2021)

Active distraction was found to be more effective in reducing fear and anxiety during the administration of Spikes anesthesia in children.

This study is the only one of its kind in terms of the technique used among researchers that used active distraction using video games in the dental clinic and combined active and passive distraction.

The results of this study also agreed with other studies in which researchers found that the use of electronic video games outperformed other distraction methods and the traditional method and achieved faster acceptance of treatment than other methods, which may be due to the tendency of most children to prefer electronic games over other methods.

(Asokan et al., 2020) (Guinot et al., 2021)

In contrast, this study differed from Aditya's study, where he compared the fidget spinner as an effective distraction, the kaleidoscope and virtual reality glasses Figure (4) as a passive or negative distraction, and found that all three methods are effective distraction methods to help reduce anxiety in children during inferior alveolar nerve anesthesia (shock spikes). This may be due to the fact that he used a manual toy that relied only on hand movement, while in this study the technique used was comprehensive of hearing and vision, with the child doing an endearing activity such as playing electronic games.

(Aditya et al., 2021)



Figure (4): The fidget spinner, the kaleidoscope game, and virtual reality glasses (Aditya 2021)

Although active distraction was superior to passive distraction, the added benefit of using video films as a passive distraction did not decrease compared to the traditional method, but with a lower success rate than in the electronic games group.

The results of this study are consistent with many studies, including the study of Al-Halabi and colleagues, whose study showed the superiority of using a tablet attached to the dental chair in distracting attention during the regional anesthesia injection procedure. (Mohammed et al., 2018) Also, a study by (Aziz et al., 2020) where the use of audiovisual distraction helped reduce fear and anxiety in children. Audiovisual distraction also played a role in reducing the unpleasant feeling during dental treatments, but it did not provide any benefit during painful procedures such as intraoral anesthesia (Ram et al., 2010) Therefore, this study relied on an additional method that forces the child to do an enjoyable activity.

Conclusions:

-Active distraction with video games and a wireless gaming handpiece outperformed passive distraction with videos during pulpotomy on primary mandibular teeth in children.

-Using a wireless handpiece and tablet with wireless headphones is a safe, effective, easy-to-use, and relatively inexpensive way for dental practices

Suggestions and recommendations:

Within the limitations of this study, we recommend the use of active distraction techniques using video games via wireless handpiece, tablet attached to the dental chair, or video films during pulpotomy in children

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