School Children's Participation In Developing Education Material about Dental Trauma

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Declaration

“Except for the help listed in the acknowledgements, the content of this thesis are entirely my own work. This work has not previously been submitted, in part or in full, For a degree or diploma of this or any other University or Examination Board”.

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Abstract

Background

Dental trauma affects around 25% of schoolchildren, resulting in functional and aesthetic impairments. The long-term prognosis of a traumatised tooth is dependent on the immediate action taken following the injury; therefore public awareness about dental trauma is vital.

Aims

1) To determine the format of educational material preferred by children who are not currently being treated for dental trauma
2) To work with schoolchildren to develop child friendly educational material about dental trauma
3) To evaluate the educational materials developed
4) To assess the suitability of the posters with children of different age groups

Methods

Phase 1: Questionnaires were distributed to 100 children aged 8-14 years, to determine their most preferred format of educational material.

Phase 2: A presentation session about dental trauma followed by classroom activities to develop posters participated by 91 schoolchildren, aged 8-9 years.

Phase 3: Evaluation by children followed by analysis by the research team.

Phase 4: Two modified versions of the posters were displayed in the waiting room area of the paediatric dentistry clinic, to evaluate children's preference and the learning outcomes.

Results

Most children in the younger age group (8-11 years) preferred posters, whereas older children (12-14 years) preferred videos. Twenty-one hand drawn posters were produced, and the top three posters were chosen by the children. Following evaluation by the research team, the highest number of domains (8) was obtained by three posters, and 19 posters had some interactive elements. Children in different age groups preferred posters, and their preference was influenced mainly by the design and information included in the posters. Information in image format were listed more commonly than information given in text format only.

Conclusion

Involving schoolchildren in research was rewarding for both the children and the research team, and highlights the feasibility and importance of involving children in development of health educational materials.

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Abbreviations

EDH: Eastman Dental Hospital

EHA: English Hockey Association

IHF: International Hockey Federation

IADT: International Association of dental traumatology

AV: Audio visual

DI-S: Debris Index-Simplified

PCA: Patient Controlled Analgesia

UNCRC: United Nations Convention on the Rights of a Child

NHS : National Health Services

DBS: Disclosure and barring services

CHAPTER 1:

BACKGROUND

1 Background

1.1 Dental Trauma

1.1.1 Prevalence

Dental trauma is considered to be a dental public health problem because of its high prevalence worldwide. The literature for the current study consisted of an electronic search of literature in; Medline (Pubmed), Proquest, Sage Journals, Web of science and google scholar using the following keywords: dental trauma, tooth injuries, child, research and dental education. Studies have shown that 25% of all school children and 33% of adults have sustained trauma to the permanent dentition (Glendor, 2008). Dental injuries are the most common oral injuries, accounting for 92% of injuries compared with soft tissue injuries or jaw fractures (Petersson et al., 1997). The Children's Dental Health Survey conducted in England, Wales and Northern Ireland in 2013 showed the prevalence of dental trauma to permanent incisors was 12% in 12 year olds and 10% in 15 year olds (Pitts et al., 2015). In a recent review of epidemiology of dental trauma from several countries, the incidence ranged from 1 to 44 new cases per 1000 persons in a year and the prevalence of dental trauma is reported to be 6-59% (Lam, 2016).

In countries with decreased caries rates, dental trauma is considered to be the major threat to the anterior teeth (Andreasen et al., 2007). Dental injuries in children commonly occur at home or in school. In the UK, a study involving adolescent school children showed 30% of injuries to the anterior teeth happened at home, and 25% in schools (Blinkhorn, 2000). Previous research suggested that boys were twice as likely to experience dental trauma as girls (Gábris et al., 2001), however other studies have found that females had the same level of risk as males (Traebert et al., 2003). Newly erupted permanent incisors in younger children have less abundant periodontal ligament fibres, making these teeth more susceptible to tooth avulsion than in older patients (Andreasen et al., 2007).

1.1.2 Aetiology and Associated factors

Most dental trauma are caused by falls and accidents; lack of coordination in very young children when they are learning to stand, walk and run increases the incidence of dental trauma in this group (Andreasen et al., 2007). In school children, injuries are most often caused while playing (Zaleckiene et al., 2014), during sports activities or being hit by another person (Glendor, 2009). Other associated causes are; road traffic injuries,

cycling (Acton et al., 1995) and intra-oral piercings (Levin and Zadik, 2012). Iatrogenic dental injuries during intubation procedure in general anaesthesia have also been identified as a cause and mainly results in crown and root fractures and luxation injuries (Newland et al., 2007). Increased overjet and lack of lip coverage of the maxillary incisor teeth have been shown to be risk factors for dental trauma (Soriano et al., 2007; Glendor, 2008). However, in contrast, other studies have shown that an increased overjet does not contribute to dental trauma (Ramos-Jorge et al., 2008; Reisen et al., 2013) and lack of lip competence was not associated with increased injuries to the maxillary incisors (Borzabadi-Farahani et al., 2010).

Studies assessing socioeconomic status as a factor linked to dental trauma have shown varying results. Higher prevalence of dental trauma has been reported among adolescents from higher socioeconomic status compared to lower socioeconomic status in Brazil, due to increased activities such as cycling, skateboarding, and horse riding (Huang et al., 2009; Marcenes et al., 2001). However other studies have concluded that educational and socioeconomic status are not related to dental trauma (Soriano et al., 2007), and a systematic review and meta analyses showed that there is no evidence available regarding the association between dental trauma in the primary dentition and socioeconomic status (Corrêa-Faria et al., 2015).

Children who have already experienced dental trauma have an increased risk of sustaining subsequent trauma, possibly due to the continuous exposure to the same factors that caused the initial trauma, such as sports and the living environment (Ramos-Jorge et al., 2008). Those who suffered dental trauma before the age of 6-10 years old are at higher risk of sustaining another episode of dental trauma compared to those aged 11-18 years. The risk of sustaining multiple episodes of dental injuries is increased by 8.4 times when the trauma occurs before 9 years old, compared to dental injuries which occurs at the age of 12 (Glendor et al., 2000). Medical conditions such as epilepsy are further risk factors for dental trauma in children (Percival et al., 2009). The upper central incisor teeth are most commonly damaged in both primary and permanent dentition (Eyuboglu et al., 2009) and comprise 90.2% of all dental injuries (Rajab, 2003).

1.1.3 Classification

Figure 1-1 illustrates the classification of dental trauma, which can vary from simple injuries such as concussion, to more complex injuries involving dental hard tissues and pulp, periodontal structures, gingiva and oral mucosa and/or to the supporting bone (Andreasen et al., 2007). In young children (aged 1- 4 years), luxation injuries are the most common type of injury possibly due to the less mineralised bone structures while enamel-dentine fractures are the most common in older children (Kramer et al., 2003).

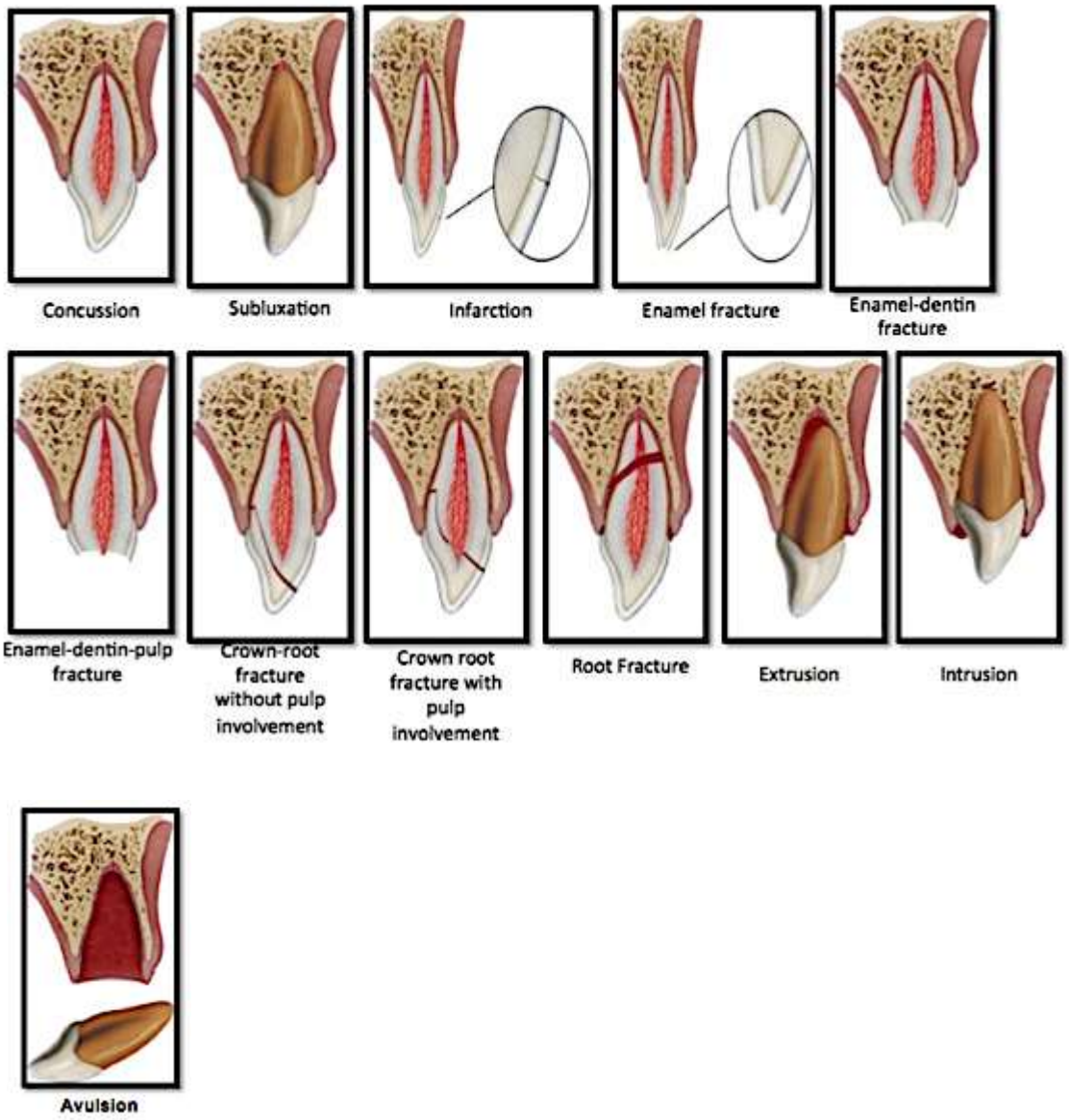


Figure 1-1: Classification of dental trauma (DiAngelis et al., 2012; Anderrson et al., 2012). Reprinted by permission from John Wiley and Sons: Dental Traumatology, copyright (2012).

The prevalence of tooth avulsion is low compared with other types of dental injuries, avulsion was reported in 3.3% of cases out of 502 teeth with traumatic injuries in children aged 7-15 years old (Rajab, 2003). However, avulsion injuries result in more complications and more complex treatments (Lieger et al., 2009).

1.1.4 Impact of dental trauma

It has been reported that 16% of dental injuries eventually result in tooth loss (Walker and Brenchley, 2000). Injuries to the anterior teeth can affect dental aesthetics, leading to emotional and social issues. Difficulties in eating and enjoying food, smiling, cleaning the teeth, laughing and showing the teeth without embarrassment have been reported as impacts of untreated dental injuries (Cortes et al., 2002). Dental trauma can also result in pain, tooth mobility and colour changes (Ramos-Jorge et al., 2008). Negative social judgments are also made about children with poor dental appearance by their peers, leading to low self-esteem and affecting social interactions (Rodd et al., 2010).

Patients with traumatic dental injuries often need long term treatment (Andreasen et al., 2007), resulting in significant costs to either the patient/parent and the health service funding that treatment. In the UK, children who experience dental injuries required an average of 21 months of treatment, with 35% of them treated for more than 36 months, and a mean number of 10.4 visits to the dentist. The average cost to treat a traumatised incisor is estimated to be £856, however this does not reflect the actual cost as only factors such as number of visits, average cost for outpatient treatment in a dental hospital and parents/carer lost working days were taken into consideration. Other factors such as transport costs, medications, dental visits to other hospitals and long term treatment once the patient is discharged were not considered (Wong and Kolokotsa, 2004).

In Denmark, the annual cost of treatment of traumatised teeth for children and adults ranges from US $2-5 million/million people/ year. The average cost of treatment for a permanent tooth with uncomplicated injuries was $420 and $1490 for complicated injuries (Borum and Andreasen, 2001). In a Canadian study, the socio economic burden of replantation of avulsed permanent incisors was explored. The mean estimated cost of treatment in the first year following trauma was $1465, and $1780 in patients who had replantation and subsequently extracted the traumatised tooth, with 7.2 hours of direct time (dentist) and an average of 9.1 dental visits per individual. The treatment cost was significantly higher in the first year for those who has their teeth extracted compared to

those who retained their incisor Loss of time at work and school was reported by 86% of parents and 90% of patients (Nguyen et al., 2004).

1.1.5 Immediate management of dental trauma

The long-term prognosis of a traumatised tooth is highly dependent on the immediate actions taken following the injury (Arikan and Sönmez, 2012). In avulsion injuries, immediate replantation results in 85-97% success in term of periodontal healing, depending on the stage of the root development (Andreasen et al., 1995). In situations in which the tooth cannot be replanted (i.e. if the child is uncooperative), the child should be taken to a dental clinic immediately, as the time the tooth is out of the mouth and the storage medium it is kept in, influence the prognosis of avulsed teeth (Lieger et al., 2009). Recommended storage medium are milk, transport media (tissue culture/transport medium, Hank's balanced solution) , saline or saliva . When a primary tooth is avulsed, it should not be replanted, as it may cause damage to the underlying permanent teeth (Andersson et al., 2012). It is therefore crucial to give information to the public about the different type of dental injuries and the most appropriate management, to ensure the best long-term prognosis.

1.2 Education about Dental Trauma

1.2.1 Knowledge regarding dental trauma

Knowledge about dental trauma is important, especially for individuals in close proximity to a child who has sustained a traumatic dental injury, such as other children, teachers, parents, school nurses, health care professionals and sport coaches. Various studies have assessed the level of knowledge of dental trauma amongst children, schoolteachers and parents. In Brazil, seven hundred and eight school children were given questionnaires to evaluate their knowledge about dental trauma, and only 19% of the children identified that dental trauma can be caused by impact trauma, while most of the children associated dental trauma with caries, toothache and the use of orthodontic appliances. Fewer than 4% of the children were aware that an avulsed tooth can be stored in milk and replanted by anyone at the accident site (Castilho et al., 2009).

In another study involving parents in Kuwait, 75% of 63 parents/guardians had no knowledge of the first aid measures for tooth avulsion, including extra oral storage time

and the storage method for an avulsed tooth (Al-Jame et al., 2007). Knowledge regarding four different types of dental trauma among primary school teachers in Turkey was assessed by questionnaires; 39% of 450 teachers had encountered dental trauma among their students, but only 8% had received information about dental trauma previously (Arikan and Sönmez, 2012).

In the UK, knowledge about dental trauma management among staff in 31 emergency departments and teachers/staffs at 102 schools were evaluated using questionnaires (Addo et al., 2007). Although 74% of staff in the emergency departments were aware of the need for immediate replantation, only a third of respondents considered that knowledge of emergency management of dental trauma was important. This study also indicated that most staff in emergency departments felt that dental personnel should manage patients with avulsed teeth, which inevitably may result in delay in tooth replantation. More than half of the school staff involved in the study had never been given any advice regarding dental trauma, and only a third of the respondents said that they would be willing to carry out replantation, the reasons being lack of knowledge, legal concerns and preferring to contact the child's parents/guardian to seek medical help. None of the emergency department or schools had written protocols or guidelines readily available for reference. The authors concluded that posters with current guidelines on the management of dental trauma should be displayed appropriately in emergency centres and schools (Addo et al., 2007). The lack of knowledge regarding emergency management following dental trauma may be due to the fact that acute dental trauma care is generally not included in the medical, nursing or first aid textbooks (Zadik, 2007; Emerich and Gazda, 2010).

1.2.2 Prevention of dental trauma

Studies have shown that 31% of oro-facial injuries are associated with sports activities (Gassner et al., 2004; Huang et al., 2009). Sports injuries contributed to 23% of dental injuries in children seen in the emergency department at Cork University Dental School and Hospital (Stewart et al., 2011). In contact sports, such as rugby and hockey, players are at risk of sustaining dental injuries and this risk can be reduced by wearing protective mouth guards (Onyeaso, 2004). Although the governing bodies of these sports have recommended the use of mouth guards, the level of compliance with their use seems to be low (Holmes, 2000). A study investigated mouth guard use among 110 English female hockey players and their attitude towards the use of mouth guard. Although 88% of

respondents owned a mouth guard, only 69% used them during a match and 50% wore a mouth guard during training sessions. The English Hockey Association (EHA) and International Hockey Federation (IHF) recommend the use of mouth guards at all time during matches and training sessions, however only 50% of the players were aware of this recommendation. The authors recommended mandatory wearing of mouth guards and almost 70% of the athletes have supported this recommendation (Hendrick et al., 2008).

A study in Canada, found that only 6% of school children used a mouth guard during sports activities (Fakhruddin et al., 2007), mainly due to lack of instruction or advice on usage by parents and coaches, followed by physical factors such as interference with breathing and speech, discomfort and aesthetics and lack of policy regarding mouth guard use in schools or sports clubs (Fakhruddin et al., 2007; O'Malley et al., 2012). According to The World Health Organization Health Promoting School program, finding solutions for dental trauma is a public health problem (World Health Organisation, 1998). A broad range of actions can be implemented at a society level to prevent dental trauma such as personal and social education aimed at developing life skills, school policies against bullying, physical environment change, school health policies, alcohol policies, school provision of mouth guards and better links with health services (Sheiham and Watt, 2000; Glendor and Andersson, 2007) .

1.2.3 Educational materials about dental trauma

Several methods for educational campaigns for children, adolescent and adult populations focusing on the immediate management and prevention of dental trauma have been recommended such as picture storybooks, manuals, posters, brochures, the Internet, TV programs, newspapers and multimedia (Andreasen et al., 2007). Although there are many possible tools that can be used to raise awareness regarding dental trauma, no ideal method has been identified so far (Arikan and Sonmez, 2012).

In a study involving 579 Kuwaiti adults aged 20 years old and above aimed to investigate their preferred source of information about emergency management of tooth avulsion, in each age group (20-28, 28-37, 38-46, >46 years) more than 50% of participants preferred information about dental trauma to be delivered verbally by a health professional. The most preferred method of receiving information about tooth avulsion among young people (20-28 years) was the internet (Al-Sane et al., 2011).

Social media such as Facebook, Twitter and YouTube are widely used by young people as a communication channel. People are increasingly using the internet to look for health related information, such as information on diseases, diet and nutrition, pharmaceuticals, online health newsletters, women's health, fitness and children's health (Reents and Millers, 1998). Information found on the Internet may influence medical decisions and may help people to manage their own conditions. However, they may have insufficient skills to assess the quality of the information or understand the complexity of the information (Eysenbach and Köhler, 2002).

In a previous study conducted at the Eastman Dental Hospital, 10-17 years old patients who were undergoing treatments for dental trauma and their parents were asked about their information seeking behaviour regarding dental trauma (Bamashmous, 2014). Ten patients and eleven parents were interviewed and questionnaires were then developed based on the interviews, to explore patient and parent's information seeking behaviour towards dental trauma, focusing on the information about the type of trauma they sustained and related treatments and how they would like to receive these information. As a part of the study, the participants' opinions regarding the best methods to raise public awareness of dental trauma was explored. The majority thought that the dentist has a role in educating children in the event of dental trauma, by visits to schools and during regular dental check-ups. Although these methods have also been suggested by other authors (Sigurdson, 2013; Glendor 2008; Alonge et al., 2001), they may not be feasible to be applied in all contexts and settings. The participants also suggested the use of educational materials (leaflets, poster and videos) as methods to raise awareness about dental trauma among the public. Among these materials, posters were the most popular materials suggested by the participants. These formats of educational materials may be more economical and simple for the purpose of disseminating knowledge and raising awareness regarding dental trauma to a large number of people.

One public source of information about dental trauma is the website belonging to the International Association of Dental Traumatology (IADT) which provides information regarding the prevention and emergency management of dental trauma (www.iadt-dentaltrauma.org). This site has a section for patients describing trauma to primary teeth (causes and complications related to permanent successors), and what to do if permanent teeth are broken or knocked out. Posters about dental trauma are also available in 18 languages. However more information regarding the long term outcomes following dental trauma for patients who had dental trauma and their parents,

would be beneficial, as a recent study highlighted patients / parents wanted information regarding the severity of the trauma, long term consequences and future treatment (Bamashmous, 2014).

NHS choices, the official website of the National Health Services (NHS) in England provides information to the public about broken and knocked-out tooth. The information in this website is about the immediate actions to be taken following dental trauma (avulsion and crown fracture injuries). A brief description of the immediate treatment at the dentist, and the replacement options available in case of loss of tooth following tooth avulsion is also included in the website. The use of mouth guard during sports is also advised as a method of prevention of dental trauma (www.nhs.uk).

A new charity called Dental Trauma UK was launched in November 2014 to help educate the public and dental professionals in the management of dental trauma. This charity aims to inform the public about tooth avulsion and to support and advise dentists in the management of dental injuries. Similar to the IADT website, posters about management following dental trauma are available. Furthermore, the Dental Trauma UK websites provides self-help videos with instructions on how to manage an avulsed or a fractured tooth (www.dentaltrauma.co.uk). However, to our knowledge the current available resources were developed by dental health professionals and the suitability and effectiveness for child population have never been evaluated.

Smartphone applications can be useful to obtain information about medical conditions. A study investigated smart phone applications related to dental trauma available for Android, Apple and Windows, using 9 phrases which could be used to search for such applications (broken teeth/tooth, chipped tooth/teeth; dental emergency; dental injury; dental trauma; fractured tooth/teeth; knocked-out tooth/teeth; tooth/teeth injury; and tooth/teeth trauma). There were 7 applications for Android phones and one for Apple and none available for Windows. Out of the 8 applications, 2 (Dental Trauma app, Dental trauma first aid app) are endorsed by the IADT and available in 18 languages, one application (AcciDent) was developed by University of Brasel, while the remaining 6 (Chipped Tooth Solution, Dental Crown Repair, Fixing Cracked Tooth, Repairing the Front Tooth and Solution to Broken Tooth) are by same developer (KBES). The first two applications are targeted for both patients and dental professionals, AcciDent is targeted at dental professionals and the remaining six applications were commercial in nature and had information unrelated to dental trauma and were deemed of limited value as sources of information (Djemal and Singh, 2016).

Written information such as leaflets, brochures, and posters are easily accessible and are inexpensive modes of delivering information to a large number of people. However, the efficiency of written information material is greatly influenced by the targeted population's reading and comprehension level (Etsey et al., 1994). It has been recommended that health care literature should be written at or below grade 5 level in the United States, equivalent to Year 6 in the UK, (Doak et al., 1996), although grade 6 to 8 reading level has also been recommended (Davis et al., 1994). Scoring systems are available to determine the readability of written materials. The Spache grade level score (Spache, 1953) is intended to be used for reading materials for children of grades 1 to 3. Another grading system available is the Simplified Measure of Gobbledygook (SMOG) formula to be used for grade 4 through to college level (McLaughlin, 1969). Microsoft word© software uses the Flesch reading ease test and Flesch- Kincaid grade level test, which is the reading ease test rates the text on a 100 point scale, and the higher the core the better the readability of the text. The Flesh- Kincaid Grade level test rates text based on the United States school's grade system (Flesch, 1948).

Distributing leaflets about the management of dental trauma to 450 school teachers in Turkey improved their knowledge about dental trauma. The teachers completed questionnaires with scenarios and questions regarding the management of different types of dental trauma, before and after receiving the leaflets. More teachers were aware of the need for dental attention following an injury, and there was a significant increase in the number of teachers who would replace the teeth back in the socket following a tooth avulsion, from 8% to 92% after the leaflets were distributed (Arikan and Sönmez, 2012).

Posters can be used for mass communication of health education to the general public, and have the advantage of reaching large numbers of people at the same time and people of all socioeconomic groups. A study investigated whether adult patients read and remembered posters in general medical practitioners' waiting area and showed that 82% of patients read the posters and of those, 95% remembered some of the content of the posters This shows that posters may play a positive role in delivering information to people (Ward and Hawthorne, 1994). Lieger et al. (2009) found that posters had a positive effect on the levels of knowledge shown by schoolteachers regarding the emergency management of dental trauma. An educational poster campaign were conducted in 155 schools in Canton of Bern (Switzerland) and 5 years later, the impact of the campaign on the knowledge of teachers was assessed by distributing questionnaires to 100 schools where the posters had been distributed, and

another 100 schools where the posters had not been distributed. The teachers who worked in the schools with the posters showed better knowledge of management of teeth injuries, especially management of tooth avulsion, with 71% of teachers aware of the correct handling following avulsion injury compared to 41% of teachers at the schools with no posters distributed (Lieger et al., 2009).

In another study, 16 secondary schools were randomised into an intervention group of 364 children and a control group with 303 children. Questionnaires were used to assess the students' knowledge and the average score for each question were recorded at baseline and again 2 weeks after displaying posters in the intervention group. Following a liner regression analysis, the participants in the intervention group had, on average, a score difference of 1.25 higher than the participants in the control group, indicating there was a positive effect on the students' knowledge about management of dental trauma (Young et al., 2014).

An audio-visual (AV) aid, in the form of DVD or video, comprising various topics on infant oral health care and prevention, was developed in accordance with the American Academy of Paediatric dentistry (AAPD) guidelines. The effectiveness of the DVD was tested using questionnaires among young mothers, and there was a significant improvement (32%) in their knowledge of infant oral health following a single viewing of the DVD, compared with prior to watching the DVD. The DVD proved to be an effective source in giving guidance regarding infant oral health in high-risk populations. However, developing a DVD may be costly and the necessary equipment is needed to be able to play the DVD (Greenwood, 2002). No audio visual aid regarding dental trauma has been reported in the literature, currently the Dental trauma UK website provides 'Self-help' videos for the public with instructions on how to manage avulsion injuries (www.dentaltrauma.co.uk).

1.3 Children in research

The role of children as active researchers has been widely accepted following the 1989 United Nations Convention on the Rights of a Child (UNCRC), as there has been a shift in the perspective of children's status in society (James and Prout, 1997; Hallett and Prout, 2003; Alderson and Morrow, 2004). Children are being recognized as social actors in their own right, rather than being a part of others such as family or school (Christensen and Prout, 2002). They have the right to express their views on matters

which affect them, including health, healthcare and research. It is now a requirement that children should be informed, involved and consulted about all decisions in their lives. The UNCRC has also highlighted children's right in research and this has resulted in an increased involvement of children as participants and co-researchers (Kirby and Bryson, 2002).

It is important that children are listened to and their views taken into consideration when planning, delivering and evaluating a service, as information gathered from children can be used to deliver dental services in a more child friendly manner (Marshman and Hall, 2008). Involving children in research has benefits to the research study itself, to the participants and the researcher. Patient information material and research reports should be produced in formats that are more child friendly (Gilchrist et al., 2013). Children's participation can ensure that research tools such as questionnaires, interview schedules, leaflets, and reports are suitable and clear to their peers. Children can be actively involved in matters affecting them and their peers by participating in research, and it provides opportunities for them to contribute towards communities and services (Kirby, 2004).

Historically, inclusion of children in research is avoided by researchers, for reasons such as lack of understanding about children's behaviour, unfamiliarity with child sensitive measurement tools and inadequate knowledge regarding the recruitment and retention of participation (Clark- Jones and Broome, 2000). Many components of the research required to be tailored to children including the consent and assent procedures, data collection method and recruitment techniques (Rice and Broome, 2004).

Ethical aspects are of a primary concern in research involving children (Punch, 2002) Some ethical consideration described by Alderson and Marrow (2004), are the need to have clear purpose of the research which will benefit the children and the possible risks in term of time, inconvenience, embarrassment and intrusion of privacy should be assessed prior to involving children in research. Confidentiality of the participants needs to be ensured and the participants need to be selected based on appropriate inclusion and exclusion criteria. The appropriateness of delivering information to participants needs to be assessed. In situation where the child refuses participation but their parents have given their consent, the researcher needs to be able to handle the situation well, and children need to be informed that if they withdraw their participation, they will not be penalised. Planning of dissemination of findings of research to the

children is also regarded as an aspect to be included when involving children in research (Alderson and Marrow, 2004).

Incentives are often used in research with the aim to encourage participation and to ensure continuity of participation of the subjects throughout the research (Rice and Broome, 2004). However, some paediatric researchers have concerns regarding the use of incentives for children in research, although others believe that it is appropriate and ethical to utilise incentives in research with children under certain conditions (Schonfeld, 2003).

Kellet (2005) involved school children aged 9-10 years, in a pilot study to assess the feasibility of children being active researchers. Six children worked in pairs and another child worked alone, to produce 4 pieces of research focusing on topics such as television viewing in children of their age, the impact of their parent's job on children and use of computers among boys and girls. The children gave their opinions about their experience in taking part in the research, and the author concluded that engaging children in research resulted in increased confidence, enhanced problem solving skills, raised self-esteem and heightened ethical awareness (Kellett, 2005).

A review was done to explore the extent of child participation in dental research conducted from year 2000 to 2005 by Marshman et al. (2007). This review categorised research with children into four categories, 1) Research with children- children as active participant; a) Included in the research process, b) share their experiences in their own words, 2) Research with children- children seen as subjects where they complete measures designed by adults (structured interviews, questionnaires), 3) Use of proxies to report on children's oral health; a) Parents/carers, b) clinicians, 4) On children- children seen as subjects of the research. Although the benefits of involving children in research are acknowledged, this review revealed that only 8 out of 3266 studies (0.3%) involved children as active participants, 7% involved children to some extent, 6% used parents as proxies and the majority of the research was conducted "on children" (Marshman et al., 2007).

An updated review in 2015 included 2950 studies showed that only 6 studies included children throughout the research process as active participants (category 1a), by involving them in development and piloting of paper and video diaries, informing the topic guides for interviews or in the development of child centred questionnaires. It is interesting to note that all the research in which children were involved throughout the

research process were undertaken in the UK. This may be attributed to the increasing emphasis in the UK to involve children and young people in matters affecting them. In category 1(b), 12 papers reported the use of semi-structured or in depth interviews or focus groups, diaries and drawing to allow children to describe their experiences, the impact of oral health, evaluate treatment or services, to give their perception on the need for oral health care, oral health promotion or evaluation of the content of questionnaires. In category 2, 496 studies that accounted for 16% of the studies reviewed involved children as the subjects in which they completed measures such as questionnaires or structured interviews designed by adults. Parents/caregivers or clinicians acted as proxies to evaluate children's perspectives in 18% of the studies (category 3). The vast majority of studies (64%) were conducted “on” children rather than with them (category 4). This review suggested an increase in studies done with children over the past decade and a decrease in studies in which children were seen as objects. However, an increase in the use of studies with proxies reflects an assumption that children are unreliable participants or too young for their views to be included (Marshman et al., 2015).

The involvement of children in research related to dental trauma was done by Wallace et al. (2016) using the framework adopted from Marshman et al. (2007) and showed that 87.5% of the research was on children. Children were engaged to some degree in 8% studies and none with children as active participants. They also discovered that all the studies were quantitative in nature, mainly using questionnaires, to assess patient's satisfaction on their appearance, children’s experience and knowledge on dental trauma and the impact of dental trauma on quality of life. The authors of this systematic review recommended and encouraged active participation of children in research related to dental trauma (Wallace et al., 2017).

1.3.1 Methods of involving children in research

Methods commonly used in research with children include quantitative methods, such as questionnaires, and qualitative methods, such as individual/group interviews, focus group discussions and participatory activities (Marshman and Hall, 2008). Factors that need to be considered when involving children in research include the use of appropriate levels of language, the setting for the research and the analysis and quality of the data obtained. The setting for the research may have an impact on the children’s behaviour, as a child may be outspoken at home but in school, he or she may be shy

and reserved. Therefore the setting of the research may influence the way children respond (Scott, 1997). In oral health research involving children, studies are usually conducted in clinical settings or schools. Children's anxiety in clinical settings may influence the way they respond and participate in research. Research in schools is generally more cost effective, but the children's response to questions may be affected by the presence of their friends and teachers (Marshman and Hall, 2008).

1.3.1.1 Questionnaire

Questionnaire has advantages such as being quick to administer, accessibility to large sample sizes and the ability to collect large amounts of data (Fargas-Malet et al., 2010). Questionnaire is useful in research aimed to explore people's behaviour, attitudes, preferences, opinions and intentions (Mc Leod, 2014), Questionnaires are also often used for evaluating new or existing services, to assess patient satisfaction or determine treatment outcomes. Questionnaires can be developed using interviews or open-ended questions to generate relevant themes and items. Some children may be more comfortable to respond via a questionnaire than answering verbally to a stranger (Hill, 1997). In a study by Rodd et al. (2011), open ended questionnaires was used to elicit the impact of visible enamel opacities on their lives and the improvement following treatments for their conditions. The findings were then incorporated into a 10-item visual analogue scale with additional box for respondents to write further comments. This questionnaire was then distributed to 63 participants to assess the impact of the treatments the children received on the quality of their life. The use of this child centred questionnaire gave insights into the impact of enamel defects on children and the positive outcomes related to the psychosocial aspects following different treatments for the condition. However, some children had higher expectations out of the treatments and this was a significant finding, as clinicians need to be aware of the expectations young patients may have and should discuss on the achievable aesthetic results with the patients prior to treatments. This type of questionnaire is useful for children to express their dissatisfaction about the service they receive as they may not be able to openly express (Rodd et al., 2011).

In dentistry, the impact of oral health conditions on the quality of life of children are often assessed using questionnaires designed for use in child population such as the Child Perception Questionnaire (CPQ) and Child Oral Health Impact Profile (Child OHIP) for use in clinical settings. The Child Oral Impacts on Daily Profile (Child OIDP)

is used for epidemiological purpose. However, children have been involved in the development of these questionnaires only to a certain extent, therefore may not cover all the areas that are important for children (Marshman et al., 2005).

1.3.1.2 Participatory techniques

Participatory techniques suitable for children include drawings, time lines or life grids and vignettes. Non-verbal communication tools, such as drawing, are useful for undertaking research with children, as they can be used with children of all ages, are considered a familiar activity, and do not demand an immediate response from the child (Marshman and Hall, 2008).

1.3.1.1.1 Drawings

In an exploratory study by Torriani et al. (2014) children's drawings were used to analyse their perceptions and expectations about dental treatment, an area of research that is important for paediatric dentists. Drawings done by children aged 6-10 years old about their experience at the dentist, and their perception about healthy and non-healthy mouths were analysed by a psychologist. Some children's symbolised their anxiety by drawing themselves lying on the dental chair with mouth open, raised arm and the reflector light above them possibly (Figure 1-2). Children may perceive these situations as threatening and 'immobilising' as they are unable to use their motor skills and speech capabilities while they on a dental chair. Some drawings had the dentist drawn with colourful clothes and hair although the dentist was in fact wearing a robe, mask and hat. The name of the dentist treating the child also was also mentioned in the drawing, indicating the child appreciated the empathy and communication skills used by the dentist (Figure 1-3). Some children drew healthy mouths as having straight teeth while unhealthy mouths had no teeth or fractured teeth, and the presence of 'bugs' in the mouth (Figure 1-4).

None of the children drew any element associated with prevention of oral health diseases such as toothbrush, toothpaste or dental floss, which may suggest that more emphasis need to be given on preventive advises during dental appointments. It is interesting to note that some children drew pictures not related to dentistry but drew pictures of houses instead. This may be because the child was thinking about something else, had little or no dental experience or a high level of anxiety preventing

the child thinking about dental experiences. This study gave evidence that importance should be given in dental care for children in terms of creating a strong rapport with the child patient and understanding and dealing with the child's feelings of submission. The disadvantages of drawings are; lack of confidence of the child in their drawing skills, the subjectivity of interpretation by adults and difficulties with analysis (Marshman and Hall, 2008).

Figure 1-2: Representation of children's drawing about dentistry (Torianni et al. 2014) Reprinted by permission from Macmillan Publishers Ltd: British Dental Journal copyright (2014).

Figure 1-3: Representation of children's drawing about dentistry (Toriani et al., 2014) Reprinted by permission from Macmillan Publishers Ltd: British Dental Journal copyright (2014).

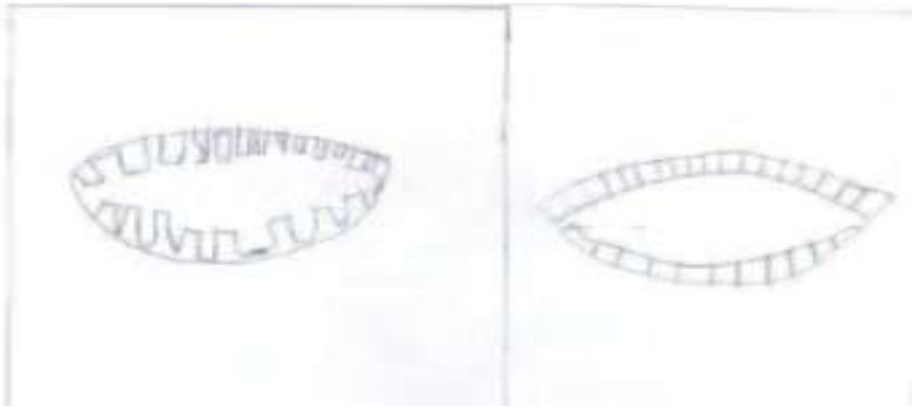


Figure 1-4: Representation of children's drawing about dentistry (Torianni et al., 2014) Reprinted by permission from Macmillan Publishers Ltd: British Dental Journal copyright (2014).

1.3.1.1.2 Diaries

Diary studies, which included drawings as a part of the diary, were used to explore the impact of oro-facial conditions such as dental caries, hypodontia, cleft lip and palate, dental trauma and developmental dental defects during transition into secondary education in 17 young people aged 11-12 years old (Marshman et al., 2009). The diary was developed with the involvement of young people to ensure it was child-centred, and was completed by 18 children followed by interviews. Findings of the study suggested that for some young people, concerns about their oro-facial appearance may be related to their adaptation to a different school, and the importance of timely dental treatment for those children with concerns about their teeth was highlighted.

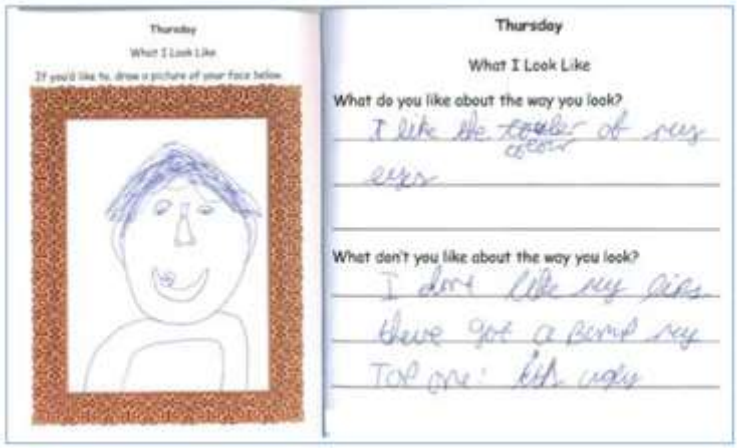


Figure 1-5: Example of a diary of a participant (Marshman et al., 2009)
Reprinted by permission from Macmillan Publishers Ltd: British Dental Journal copyright (2014).

Perspectives and experiences after having dental extractions under general anaesthesia in 10 children aged 6-11 years old were evaluated using a video diary (Rodd et al., 2014). New insights into children's negative experiences, as well as previously reported post-operative effects were discovered through the video recordings and semi structured interviews; hunger, disturbed eating, being scared/worried, discomfort from the intravenous cannula. Positive impacts were also reported such as satisfaction with the resolution of their problem and rewards and attention from family members.

1.3.1.1.3 Time-lines

Time-line exercises can be used with children to chart important events in their lives (James, 2005). Time-lines, in conjunction with interviews, were used in a study to explore children's experiences of the cleft lip and palate care pathway. Seventeen participants aged 8-17 years old, constructed time-lines to highlight key events in their lives and gave comments along the way. The time-line described the children's lives and the inclusion of the their past, current and future treatment indicated their significance to the child (Hall et al., 2013).

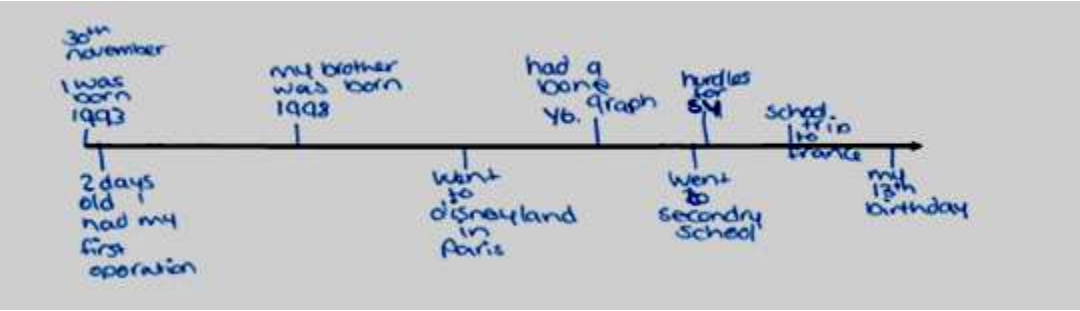


Figure 1-6: Time time illustration of a child with cleft lip and palate (Hall et al., 2013) Reprinted by permission from Allen Press Publishing Services: The Cleft Palate Craniofacial Journal, copyright (2013).

1.3.1.1.4 Life grids

A Life grid is a chart with rows showing years in a participant's life and columns representing different areas of their life (Richardson et al., 2009). Life grids were typically used in retrospective studies for respondents aged 60 year and over, however in a study by Wilson et al. (2007) life grids were used to explore young people's experience of parental substance abuse. The life grid consisted of a time line across the top of a sheet of A3 paper and underneath the time line signified different aspects of participants' lives such as school, home, interest and significant events at certain times. The participants used the life grid to denote events in their life according to the aspects at a particular time in their lives. Both time-lines and life grids can be used to explore young people's experience around certain issues in their lifetime (Wilson et al., 2007).

1.3.1.1.5 Play

Play is an important element in childhood. Recently, University of Cambridge launched a centre for research on play, education, development and learning (PEDAL) aimed to expand research regarding role of play in young children's education and development and learning. Play possibly can enhance learning, supports emotional and mental health as well as creativity competence (https://educ.cam.ac.uk/centres/pedal/).

The role of play is also increasingly being recognised as an appropriate way to engage with children in research. Researchers working with young children within education, health services and counselling use play based approaches to seek children's views

(Boyden and Ennew, 1997). Different types of play have been discussed in the literature such as physical play, play with objects, symbolic play, pretence/ socio-dramatic play and games with rules (Whitebread et al., 2012).

In dentistry, a study compared the effectiveness of conventional and game-based oral health education on the oral health-related knowledge and oral hygiene status among 120 children aged 5-10 years old (Maheswari et al., 2014). The children's knowledge regarding oral health was evaluated using questionnaires and their oral hygiene status was examined using the Debris Index-Simplified (DI-S) and categorised as ‘good’, 'fair' and 'poor'. Participants were divided into 2 groups and the first group received oral health education through flash cards only and the second group used play methods once a day for a week (snake and ladders combined with flash cards). The evaluation of children's knowledge about oral health and the DI-S following the interventions were repeated on day 1 and after 3 months. Children involved in the play intervention achieved higher mean scores of oral health knowledge and a significant increase in 'good' oral hygiene, and a decrease in 'fair' and 'poor' hygiene at both time intervals compared to baseline scores. Game-based learning proved to be an effective aid to educate children about oral health. This method may be a convenient and fun activity for the children and messages delivered in the games can be reinforced each time children play the game.

1.3.1.3 Focus groups

Krueger (1994) described a focus group as “a detailed discussion designed to obtain the views on a particular topic in a comfortable, non-threatening setting” (Krueger, 1994). A focus group ideally consists of a small group of 6-12 members, and should last less than 45 minutes for children below 10 years, but can be up to 60 minutes for children between 10-14 years of age (Vaughn et al., 1996). Children under the age of 6 years are generally not included, as they may not have the social or language skills to participate in group discussions (Greenbaum, 1998). In a study by Klein et al. (1992), focus groups were carried out with children of 3 different age groups, including a group of 4-5 year olds, exploring the influence of candy cigarettes on smoking behaviour and attitudes. Following the focus group discussion with the participants, the author concluded that candy cigarettes might have a role in developing children’s perception towards smoking as a norm and this led to the author to advocate elimination of this product (Klein et al., 1992).

Focus groups are useful to evaluate the effectiveness of a particular programme, to construct questionnaires or to adapt questionnaires in different cultural settings (Heary and Hennessy, 2002). They can also be utilized to assess the needs of a specific population and assist in the development of effective health promotion programmes. Focus groups combined with creative participatory activities such as drawing and writing can be used in large scale national projects or small local projects to aid in development of age appropriate patient or participant information material (Gilchrist et al., 2013). Focus groups are a versatile research approach and can be used alone or in combination with other qualitative or quantitative methods (Vaughn et al., 1996).

In dental research, focus groups were used to assess the knowledge of 32 school children in two age groups (8-9 years old and 13-14 years old) from two different socio-economic groups, about dental erosion and soft drinks. Results showed that the younger age group preferred still, fruit flavoured drinks whilst the older group preferred carbonated drinks and only the older children from the high socio-economic groups were aware that acidic drinks could damage their teeth. Children from each group had different opinions on how to solve problems caused by erosive drinks. Older children thought picture of rotten teeth should be placed in places where children usually go to in order to reduce consumption of the drinks. The younger children thought that promoting the positive impacts of healthier drinks such as milk was a good solution (May and Waterhouse, 2003).

1.3.2 Children's participation in developing health educational material

The NHS considers provision of high quality children's health information as central to empowering children and young people to have a choice, make decisions, and learn to self-care in age-appropriate ways. Research done by Williams et al. (2011) investigated the requirements for age appropriate health information among children and young people with long term (diabetes, asthma, epilepsy and complex heath care needs) and acute care (planned ENT and unplanned orthopaedic interventions) conditions. As a part of the research, children were involved in focus group discussions to explore the factors that influence their acceptance towards health information and to capture their views on the types and preferred formats of information resources. The children were divided to 3 age groups (6-10), (11-15) and (16-18).

The findings of this research showed that children preferred real images rather than cartoons in information resources regarding health conditions. Information resources targeted for each age group were shown to the children and they often identified the resources as ‘too young’, too old’ or ‘adult’. The author concluded that children in different age groups did not always prefer the resources targeted for their age. Semi-structured interviews were conducted with 46 children and 52 family members and they recommended child centred information resources to be written by children, with separate resources for adult and children and using interactive props to convey information. Parents and children thought that children’s information resources were often dense, used incomprehensible medical terminology and were complex to understand. They also preferred information supported by the latest research evidence. The authors recommended information funders and producers ensure the information resources targeted for children are produced with children and young people, evidence based and take into consideration children’s preference of the types, format and content of resources (Williams et al., 2011).

Direct participation of children in the development of health educational materials is not widely reported in the literature. In adult populations, patients have been involved in developing healthcare policy and research, guidelines and patient information material. Patient involvement is thought to result in better quality material with greater clinical relevance (Nilsen et al., 2006). Patient information leaflets on Patient Controlled Analgesia (PCA) were developed through consultation with patients who had undergone major surgery. In the new leaflets, diagrams were used to explain the reasons why the machine bleeps, how to use the PCA and how it is attached to the patient. Questionnaires were used to evaluate knowledge about the PCA and patients who received the leaflets had more knowledge about the drugs used, the side effects, and were more informed about the ways they could use the PCA compared to those who had read the old style leaflets. Both leaflets were tested using the Flesch formula which measure the text difficulty by checking word and sentence length (Ley, 1988) and the new leaflet was ‘fairly easy’ to read while the old leaflet had score ‘fairly hard’ to read (Chumbley et al., 2002).

In another study, three new leaflets about different endoscopic procedures were developed after consultation with 136 adult patients undergoing endoscopic procedures, comparing new and old leaflets in terms of anxiety related to procedures and patient satisfaction. More than 50% of patients were interested to learn about the post procedural problems while additional information related to the procedure itself

and the equipment seemed to be of less importance. The leaflets were assessed using questionnaires in 235 patients undergoing endoscopic procedure who received either the old or new leaflets. The mean anxiety score was higher in the group of patients who received the old brochures with a p-value of 0.04, whereas the new brochures were useful in reducing patient's anxiety before the procedures. More than 80% of the participants graded the quality of the information in the new leaflets as ‘good’ or ‘very good’ by 84% participants, however this was not compared to the old leaflets (Aabakken et al., 1997).

In the medical field, children have been involved in designing healthy food promotion materials to improve children’s vegetable consumption. Thirty thousand students in four public elementary school participated and the schools were divided into 4 groups consisting of: 1) control group, 2) participation only, 3) marketing only and 4) participation and marketing. The students in the two schools with participation roles designed posters with vegetable characters as homework in their own time for 2 weeks. Students in the ‘participation and marketing’ group produced 128 posters and 19 posters were selected by the researcher and displayed above salad bars in the schools in group 3 and 4. Student’s vegetable consumption and plate waste were recorded by taking photos of the student’s plate after they have selected their food and after the have finished eating. Children who were involved in designing the posters and were exposed to the posters (group 4) increased their vegetable consumption significantly more than children who were involved only in the development of the poster or only exposed to the posters. The author concluded that involving children in production of healthy food promotional materials might have a positive impact on encouraging healthy eating habits (Gustafson et al., 2017).

Primary school children in Kenya were engaged in the development of posters about hand washing. It was hypothesised that by involving children in poster production and installing the posters in classrooms, hand washing behaviour among the children would improve. Eleven schools received the poster intervention and twelve schools were in the control group without the poster intervention. Pupils participated in the poster making either individually or in collaboration with others. Those who did not want to draw a poster created slogans related to the theme. One poster from each school were chosen based on the accuracy of the hygiene promotion message, artistic merit, and overall clarity. These posters were then printed and displayed in the every classrooms in the intervention schools. Evaluation of the hand washing behaviour was carried out before and four months after the intervention in all the participating schools. No

intervention effect was observed in this study, and the author attribute this to the presence of other hand washing campaigns by multiple organisations in the schools. This study proposed the feasibility of engaging educational methods such as poster development among primary school children to improve hand washing behaviour (Graves et al., 2012).

In a community action research programme about health, food and alcohol, 8 drawings by school children in Florence, Italy were printed as posters and used as part of a health education programme (Figure 7). A hundred posters were hung on buses serving the community area, and 210 people getting on and off the buses were interviewed and asked if they noticed the posters. Although only 6% of people noticed the posters on the buses, the drawings were said to be greatly appreciated throughout the community (Allamani et al., 2000).

Figure 1-7: Posters produced by children (Allamani et al., 2000)
Reprinted by permission from Taylor and Francis Group: Substance Use and Misuse, copyright (2000).

A leaflet on oral health was produced for school children aged 11-12 years old after obtaining information on possible factors to improve oral health through a series of focus groups. The children expressed their opinions about existing leaflets and posters and stated that they were “too wordy”. They suggested that a leaflet should be in colour, easy to read and should have 'romantic' storylines featuring people of their own age. Based on the findings of the focus group discussion, three leaflets were developed focusing on a self-improvement approach, encouraging self-esteem and decision-

making skills. However children were not involved in designing of the leaflets. The leaflets were distributed to reinforce messages regarding diet, periodontal diseases and tooth brushing given to children aged 11-12 years as a part of one year long dental health education program in the school. Questionnaires were then completed by 895 children (mean age 12.1 years) at the end of the programme to elicit their opinion regarding the leaflets. The results indicated that there were positive impacts on the participant's oral health behaviour as 93% of them claimed to care better for their teeth, and 58% of them had increased the frequency of tooth brushing. The storyline in the leaflet were appreciated by 71% of the participants. However, although the leaflets were designed following consultation of children in the same age group, only 52% of the participants thought that the leaflets were attractive (Redmond et al., 2001).

To our knowledge, no educational material about dental trauma has been developed through active participation of children. This present study aims for educational materials to be developed by children, which can be used as source of information for the public about dental trauma management especially for children.

CHAPTER 2:

AIMS AND OBJECTIVES

2 Aims and Objectives

The aims of this study were:

1) Phase I - to determine the type of educational material about dental trauma preferred by children who were not being treated for dental trauma.
2) Phase II - to work with school children to develop educational material about dental trauma.
3) Phase III - to evaluate the educational materials developed.
4) Phase IV - to assess the suitability of the posters for children of different age group.

Objectives:

1) To use questionnaires to determine the type of educational material about dental trauma preferred by children who were not being treated for dental trauma.

2) To utilise classroom based activities to develop child friendly educational material about dental trauma.

3) To allow the children themselves and the research team to evaluate the educational material.

4) To assess the suitability and learning outcomes provided by the educational posters developed by children using appropriately designed questionnaires.

CHAPTER 3:

PHASE 1

3 Phase 1

3.1 Methodology

3.1.1 Study design

The initial plan for the first phase of the study was to conduct focus groups with school children to determine the preferred type of educational material and to explore their ideas for developing the educational materials. Several schools were approached via phone, emails and letters between July 2015 and December 2015 without success. The sources explored are presented in Table 3.1. An alternative plan was then pursued which involved a questionnaire based audit to determine the type of educational material preferred by children attending the Paediatric Dentistry Department at Eastman Dental Hospital but not currently being treated for dental trauma. Children aged 8-14 years old were included, to represent children from primary school and secondary school. The research team continued to invite potential schools to take part in phases 2 and 3 of the study and were fortunate in eventually obtaining agreement from Highgate Junior school, an independent school located in north London.

	Sources explored	Contacted via	Outcome
1	UCL Academy	Emails, phone	No response
2	UCL Research Network	Emails and phoned the person in charge- Mr. Chris Owen	• UCL Research Network usually includes research with greater scope with multiple phases and requiring involvement from many schools. • Mr. Chris Owen offered to contact teachers who had involved with UCL Research Network projects, however there was no response despite several follow ups.
3	Whittington CDS school programs	Ms. Wendy Bellis	No school programmes are being conducted at that time.
4	Schools known to staff at EDH and EDI	Emails were circulated to staffs to inform them about the study and enquire if their children's schools could be approached.	No positive response from schools approached.
5	Westminster Academy	Contacted in person and phone calls and emails.	A teacher was interested initially, however unable to speak to him further due to unavailability.
6	Highgate Junior School	Contacted the headteacher known to an EDH staff member via emails and then directed to the Head of Science	Showed interest in participating in the study. Meeting was arranged to discuss the details.

Table 3-1: List of sources explored

3.1.2 Ethical approval

Ethical approval for the research was obtained from the University College London Research Ethics Committee, on the 12/06/15, project ID number 7123/001 (Appendix 1).

Phases 1 was also registered with the Eastman Dental Hospital Clinical Governance Committee.

3.1.3 Inclusion criteria

1) Patients attending the Paediatric Dentistry Department who were aged 8-14 years and old who were not being treated for dental trauma.

2) Patients who were able to understand and read English.

3.1.4 Exclusion criteria

Patient who were not able to read English or understand the nature of the questionnaire.

3.1.5 Questionnaire development and piloting

A short questionnaire was developed based on the results of a previous study (Bamashmous, 2014). This study showed that patients with traumatic dental injuries thought information leaflets, posters in public places and Internet videos were likely to be most useful. These three options were therefore included in the questionnaire (Appendix 2) and participants were asked to indicate their preferred choice and were also given the opportunity to write down any other ideas they had.

Several drafts of the questionnaire were developed. The questionnaire was made as simple as possible, with pictures related to the options given to ensure all children within the targeted age range could understand. The readability of the questionnaire was tested using the Flesch formula via Microsoft® Word. The questionnaire scored 82.8 for the Flesch Reading Ease and the Flesch-Kincaid Grade level test was grade 4, which corresponds with the reading ability of 8-9 year olds (Flesch, 1948). The questionnaire

was piloted with 10 children aged 8-14 years and they were asked if they could understand the questionnaire and if they would make any changes. All of the participants could understand the questionnaire and they thought that the questionnaire was eye catching and the pictures representing the options were easy to look at, therefore no amendments were necessary.

3.1.6 Questionnaire distribution

Potential participants fulfilling the inclusion criteria were identified from the daily clinic list and clinical notes of patients attending the Paediatric Dentistry department. The researcher (EK) approached parents/carers to obtain their consent. Verbal explanations were given to the child and the researcher emphasised that the child should fill in the questionnaire themselves rather than the parents. The researcher was available to clarify any questions the children had when each participant completed the questionnaire. Although the participants were not required to state the reason for their preference, seven of the participants made verbal comments about their preference as they completed the questionnaire.

3.2 Results

3.2.1 Demographic data

A total of 105 patients fulfilling the inclusion criteria were approached for this phase. Two parents felt that their children would not be able to participate due to anxiety while waiting to be seen by their dentist, two parents stated that their child could not understand English and one said that the child had had a long day at school and was too tired to take part. Therefore, 100 patients completed the questionnaires, of which 54 were females and 46 were males. The age of the patients ranged from 8-14 years old, with a mean age of 10.1 years.

3.2.2 Questionnaire analysis

The participants' responses were transferred into SPSS software version 24 and simple descriptive analyses were carried out. The preferred type of educational material chosen by the respondents is presented in Figure 3-1. The results showed

that the most preferred option was a poster (43%), followed by a video (32%) and a leaflet (21%). Four children had other ideas: comic books (n=1), Apps with games for smartphones (n=1) and websites about dental trauma (n=2). Posters were the most preferred type of educational material in both male and female respondents. Just over half of the males (52%) and 35% of female respondents chose posters as their preferred option (Figure 3-2).

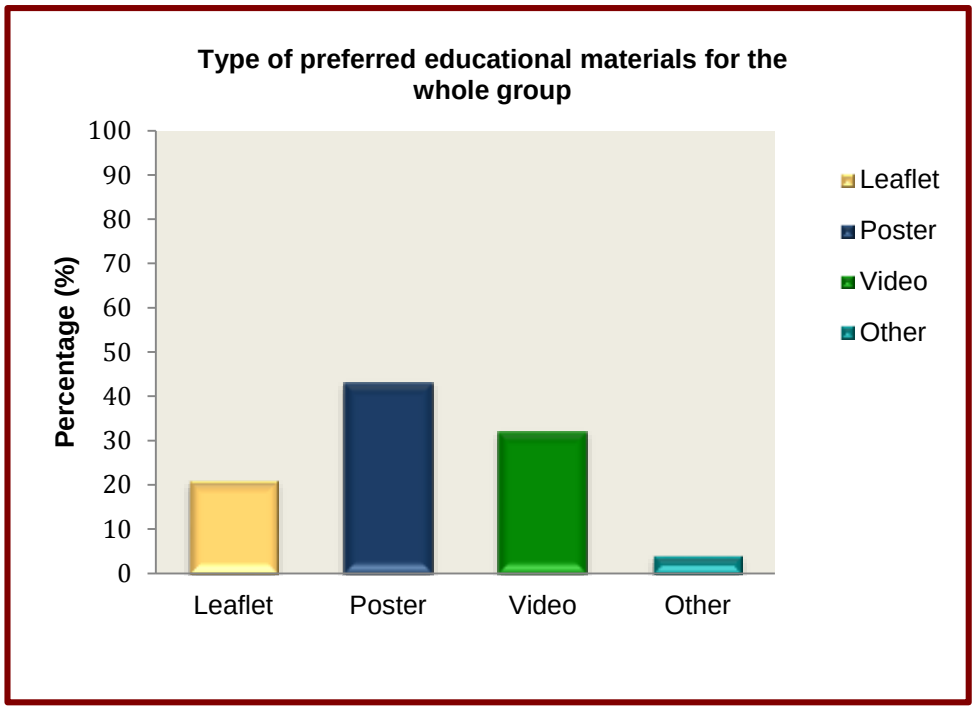


Figure 3-1: Preferred educational materials for the whole group

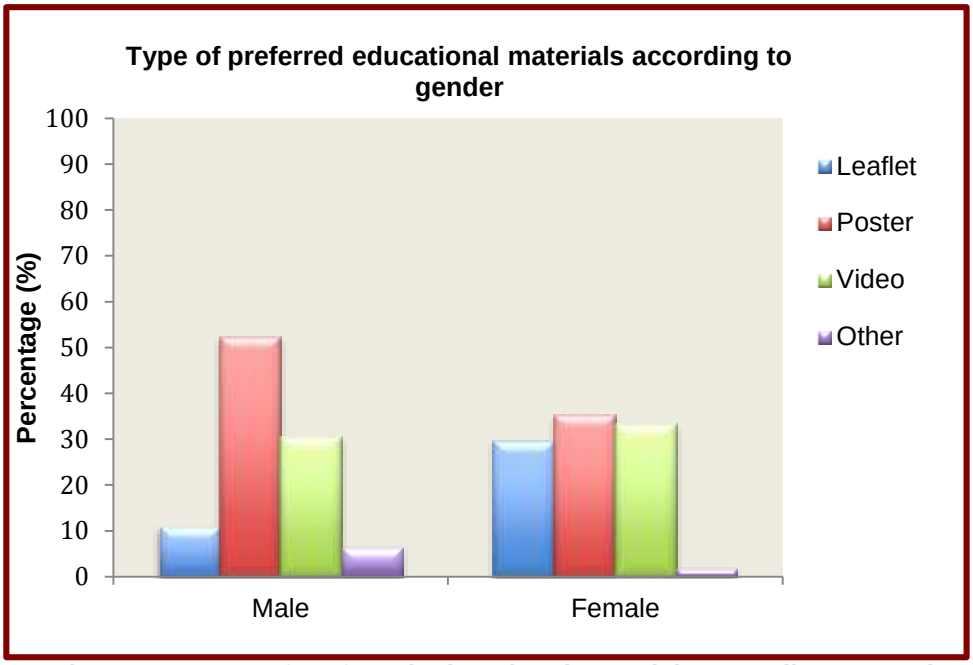


Figure 3-2: Type of preferred educational materials according to gender

To determine if age affected preference of material, the children were divided into 2 age groups; 8-11 years (n=59) and 12-14 years (n=41). Results were analysed by both age and gender as shown in Figures 3-3 and 3-4. More than half of the children in the younger age group (8-11 years old) preferred posters, whereas older children (12-14 years old), felt videos were preferable.

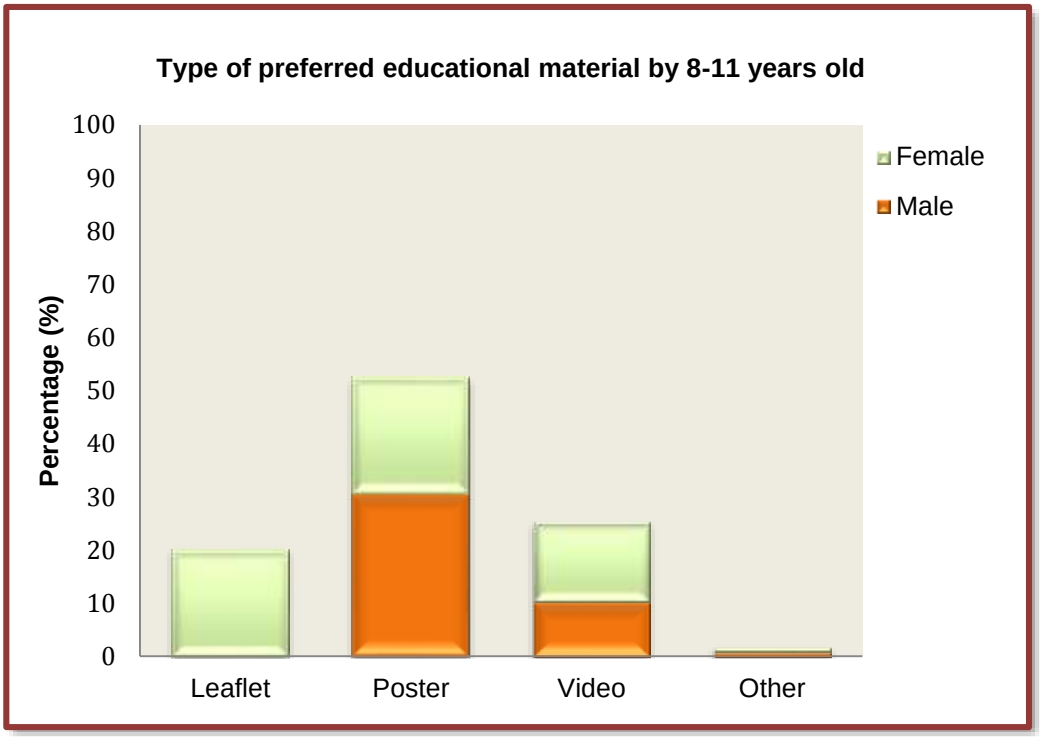


Figure 3-3: Type of preferred educational material by 8-11 years old children, according to gender

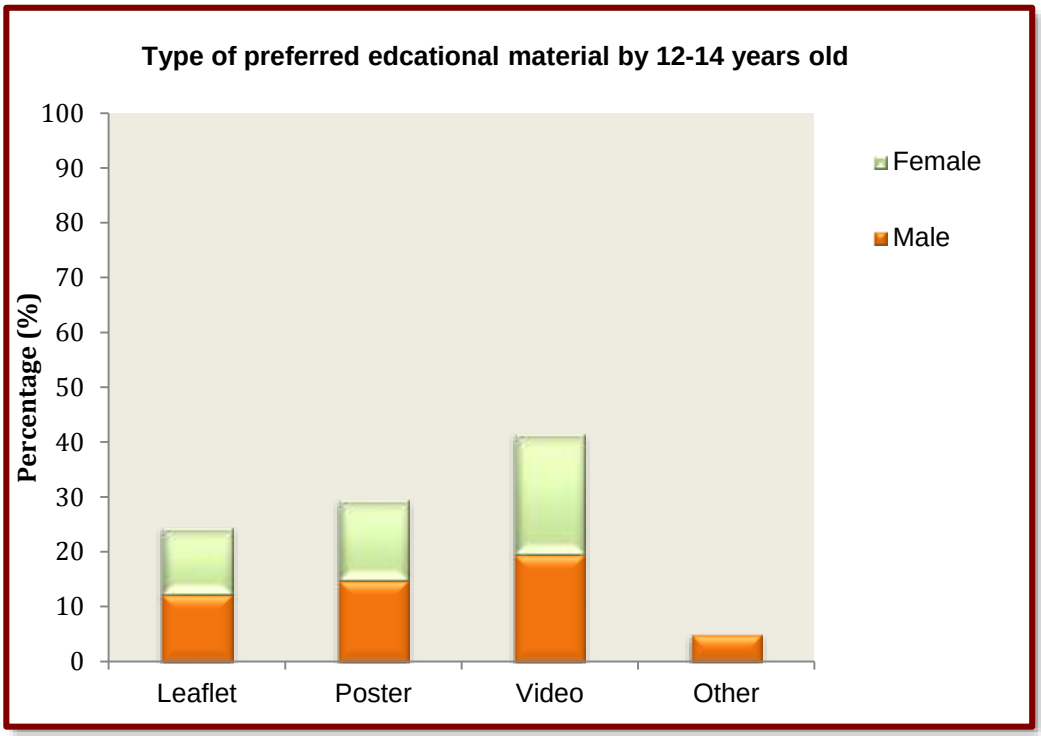


Figure 3-4: Type of preferred educational material by 12-14 years old children, according to gender

3.3 Discussion

3.3.1 Demographics data

The participants for this study were children who were not undergoing treatment for dental trauma, as it was hypothesised that they may have a different response than those who had already suffered dental trauma. Children aged 8-14 years were selected due to the high prevalence of dental trauma in this age group. Very young children (< 7 years old) were excluded, as it was intended to concentrate on injuries to the permanent teeth. Children aged 8 years old and above, can be included in surveys provided the questions are appropriate to their language and reading skills and it is important to pre-test the questions to ensure their understanding (Borgers et al., 2000), hence why a pilot study was undertaken.

3.3.2 Questionnaire development and distribution

In the previous study (Bamashmous, 2014) a questionnaire on information seeking behaviour about dental trauma among children who had suffered dental trauma, was developed following interviews with children. The children suggested making educational material such as posters and leaflets available in waiting areas in dental clinics and doctor's surgeries, posters in public places and sports clubs. Internet videos were also suggested by a number of respondents. These options (poster, leaflet, video) were included in the questionnaire used in the current study. A simple questionnaire was developed with pictures representing the options to make it easier for the children to understand. Readability of the questionnaire was tested using the Flesch Reading Ease and Flesch Kincaid Grade Level tests. Although the reading age for the questionnaire was 9-10 years old (grade 4.4), this was deemed acceptable. The questionnaire was piloted to ensure suitability for the children of the age group targeted.

Potential participants were approached in person by the researcher (EK) to maximise participation. As the questionnaire involved ticking only one of the options, respondents completed it quickly. All respondents were approached while they were in the waiting room area, and their treatment time was not disrupted.

3.3.3 Results of Phase 1

Overall, posters were the most preferred educational material followed by videos and leaflets. One of the respondents also mentioned that if posters were displayed in schools, everyone would look at them daily and therefore they would remember the content.

Direct comparison of the findings in the current study with the previous study (Bamashmous, 2014) is difficult, as the aforementioned study included other public educational campaigns that can be used to raise awareness regarding dental trauma (i.e. talks by dentist, training for school teachers) and the participants were allowed to choose multiple responses. Comparisons between the two studies are made wherever possible. Among the educational materials suggested to raise awareness in the previous study (Bamashmous, 2014), posters were the most popular choice selected to raise awareness regarding dental trauma and this was supported by the findings in the current study. Posters were the most popular choice for males and females, and also the most preferred option in the 8-11 year age group.

One third of respondents in the current study thought that videos would be a good method and this was the most preferred choice for the older children (12-14 years old). One patient stated that internet videos are useful to look up information. Although there has been an increase in the usage of the internet among young children, there are risks associated with the privacy and safety of young children and it has not been established whether children have the capacity to utilise the internet in a safe manner. Therefore the internet service and content providers should consider the security and privacy features appropriate for children to ensure their safety (Holloway et al., 2013).

Another participant felt that videos are useful for people who may not be able to read such as young children. One of the respondents commented that videos shown on television are more appropriate and made a point that there may be people who do not own a computer or use the internet often. One of the participants noted that videos are suitable for all age groups as they can be in the form of animations or actors. In contrast, in the previous study by Bamashmous (2014), more than half of the respondents who were undergoing treatment for dental trauma, said that they would not be interested in watching a video and some thought that it would be scary to watch videos about traumatised teeth. The differences here may be attributed to the fact

that the patients in the current study had not experienced dental trauma, therefore they may have a different perceptions.

Leaflets were the least preferred option. One participant who chose leaflets felt more information can be easily distributed to a lot of people and could easily be referred to if dental trauma happened. One respondent discussed that leaflets tend to have lots of words and information. These comments may be influenced by the picture of the leaflet shown in the questionnaire, as the leaflet contained quite a lot of text. Leaflets with fewer words might have been more attractive for the children. This also suggests that information leaflets aimed for children should be designed with brief wording and simple language, however there were no such leaflets regarding dental trauma targeted at children which could have been used as an example in the questionnaire.

Four children had other suggestions, in addition to the three options available in the questionnaire, three of them mentioned phone applications 'Apps' as a method to give information about dental trauma. This method was also included in the questionnaire in the previous study as a source of information for patients with dental trauma (Bamashmous, 2014). However, in terms of raising awareness about dental trauma among the public, none of the respondents in that study suggested smartphone applications, hence the option was not included in the current study.

CHAPTER 4:

PHASE 2

4 Phase 2

4.1 Methodology

4.1.1 Subjects

This phase involved year 4 pupils at Highgate Junior School, an independent coeducational school in an urban area in north London. The children were all 8-9 years old.

4.1.2 Inclusion criteria

Children who had given their assent and whose parents consented to their participation.

4.1.3 Exclusion criteria

Children who had did not given their assent or where parental consent had not been obtained.

4.1.4 Meeting with school staff

The teachers and the research team were involved in planning of the activities. The research team proposed the idea of having two different age groups (primary school and secondary school) children involved, however as the existing syllabus in secondary school was extremely busy, it was not feasible to incorporate this research into their lessons. Therefore primary school children aged 8-9 years old were included, and as the results of phase I had indicated that posters were the most preferred method of receiving information regarding dental trauma in this age group, posters were chosen as the resource which would be developed by the children.

An initial meeting was arranged on 26/02/16 with the Head of Science to discuss the project, and provisionally plan the activities for the children. As year 4 pupils learn about teeth in Science, it was agreed that it would be appropriate to include the project as an extra activity in the Science curriculum. The information sheets (Appendix 3 and 4), consent forms form (Appendix 5) and assent form (Appendix 6) were shown to the

teachers for comments. The teachers felt that the word trauma might be intimidating and may raise concerns amongst parents, therefore 'dental trauma' was changed to 'Injuries to teeth'. Originally, phase 2 was planned to be carried out in May 2016 but due to the school refurbishment, this was delayed until October 2016.

A further meeting was arranged on the 22/09/16 to discuss the details and options of developing either handmade posters or using computer graphics. Handmade posters were preferred due to the limited number of computers in the school to accommodate all pupils at the same time. Information sheets, assent forms for the children and consent forms for the parents were distributed by teachers to all 92 pupils in year 4. Activities were subsequently planned in the following format:

1) A presentation about dental trauma to the year 4 pupils.
2) Classroom based activities to create posters about dental trauma.
3) A judging session to choose the best poster during assembly.

Disclosure and Barring Service (DBS) documents for the research team who were involved in the activities were submitted as per the school's request. The teachers agreed that the name of the school could be disclosed in publications but not the name of individual pupils.

4.1.5 Presentation about dental trauma

Two types of presentation (using Prezi online presentation software and Microsoft ® Power Point software) were prepared and given to the Head of Science to show to the other year 4 teachers, so that they could choose the most appropriate presentation for the children. Some clinical photographs were deleted as per the teacher's request and the term 'Injuries to teeth' was used throughout the presentation instead of 'dental trauma'. The teachers agreed that the Power Point presentation was more appropriate, as it was more familiar to the children and Prezi software required an Internet connection, which was not available in all rooms.

In order to be more confident while presenting to children, the researcher (EK) had several practice sessions with 6-11 year old children known to the researcher, and also with other colleagues and supervisors. Children were also asked about the design, colours, photographs and fonts used in the presentation. Some minor changes were

made accordingly. Feedback was also obtained from the researcher's colleague to assess the content of the presentation, and presentation style. This was practised until the researcher and the supervisors were happy.

An interactive presentation on dental trauma using Power Point software was given to the pupils by EK in the school hall on the 11/10/16. A total of 20 minutes were spent on the presentation and five minutes for questions from the pupils. At the end of the presentation, the poster activities were explained to the children. The children were also informed that there would be a prize for the winning group.

The main learning outcomes of the presentation were the different types of dental trauma, immediate management according to the types of dental trauma and prevention of dental trauma in sports. Some general information about dental trauma was also included. The contents included in the presentation are described in more detail below.

The presenter began the presentation session by introducing herself to the children, in order to build rapport. This was followed by an introduction about teeth, including the functions of teeth (eating, speaking, smiling). Smiling photos of popular pop stars whom the research team thought the children would know were used to show the children examples of nice smiles. The prevalence of dental trauma was introduced by explaining that 25% (or 1 in 4) people have experienced dental trauma at some point. Gender distribution of dental trauma was also included. Some causes of dental trauma were given and included activities specific to this age group including trips, falls, trampoline and sports. Upper anterior teeth were discussed as the teeth that are most likely to be injured in the event of dental trauma and some of the complications of dental trauma included in the presentation were pain, difficulties in eating, and injuries to teeth leading to loss of teeth. Aesthetic consequences were also explained.

The importance of taking the correct actions if dental trauma happens was emphasised. The children were advised to remain calm and let an adult know about the incident. For a broken tooth, the advice was to try to find the broken fragment and keep it wet and take it to the dentist as soon as possible. The options of attaching the fragment back to the tooth or restoring the tooth with composite restoration were explained using clinical images. For avulsion injuries, the importance of differentiating between permanent and primary teeth was emphasised, and management discussed. For luxation injuries, the children were advised to go to the dentist

immediately and the researcher explained that the dentist might be able to push the tooth back to the original position. Finally, prevention of dental trauma using mouth guards during sports was encouraged. The Power Point presentation in included in Appendix 7.

The researcher asked several questions related to the contents of the presentation during the presentation. The children were asked to raise their hand in order to answer the questions and were randomly selected to answer by the presenter. The questions asked by the researcher are shown in Table 4-1.

No	Question asked by the researcher
1	What are the functions of teeth?
2	What is dental trauma (injuries to teeth)?
3	Which sports can cause injuries to teeth?
4	Which teeth did they think are more likely to get damaged?
5	Which medium was the best to store a fractured fragment? (Options given)
6	What should be done in avulsion injuries? (Options given)
7	How many of them owned a mouth guard?
8	How many of them used mouth guard?
9	Did they think learning about dental trauma was important?

Table 4-1: Questions asked by the researcher during the presentation session

Immediately following the presentation, the children participated in the classroom activity. There were 4 classrooms with 5 groups in each classroom and each group consisted of 2 to 4 children. The distribution of groups was managed by the class teachers. The research team provided A1 sized paper and the school provided other resources needed.

Two members of the research team (EK, SP) facilitated the activities with the class teachers and the researchers answered any questions. At the beginning of the session a handout of the Power Point presentation was given to each group for reference. This activity was planned for 1 hour and unfinished posters were completed during their science lessons the following week. A token of appreciation in the form of

highlighter pens (shown in Figure 4-1) were given to all of the participating children at the start of the session.

Figure 4-1: Highlighter pen given to participants

4.2 Results

4.2.1 Demographics

A total of 91 out of 92 year four pupils took part in this phase; one pupil was not included, as his/her parents did not consent for participation. The teachers arranged a different activity for this pupil whilst the others took part in the research.

4.2.2 Presentation about dental trauma

The children engaged very well with the researcher throughout the presentation. They paid attention and several children put their hand up every time a question was asked. Some of the children also showed engagement by sharing their stories about teeth and dental injuries.

4.2.3 Classroom based participatory activities

The pupils asked a number of questions during the presentation session and activities in the classrooms. The questions asked are presented in Table 4.2. The children worked in groups and different interaction dynamics were observed during the activity. Some of the groups had a group leader who gave the main ideas and the rest of the members added their ideas. Other groups had a group discussion prior to working on the poster and decided what information they should use. In others, pupils started

working individually and then placed their work together in the final poster. A total of 21 posters were produced and each poster was numbered (1-21) for identification purpose. Images of all posters are included in Appendix 7 and on the CD-ROM attached.

Theme/Subject	Questions asked by the children during presentation sessions and classroom activities
Causes of dental trauma	What are other causes of dental trauma?
Immediate managements of dental trauma	Why are primary tooth not replanted? Why does an avulsed tooth need to be kept wet? Why does the tooth needs to be held only by the crown? What if there is no dentist available when dental trauma occurs?
Treatment for dental trauma	Are splints and braces the same? How long will a tooth be splinted for? Will braces be needed for the traumatised tooth?
Long term prognosis	Will the tooth be as strong as before? Will eating be affected if the tooth becomes loose? Will the tooth grow as normal? What happens if the tooth is lost?

Table 4-2: List of questions asked by children during the presentation session and classroom activities

4.3 Discussion

4.3.1 Planning of the activities

The delay in starting this phase of the study was due to the difficulties of finding schools that were willing to participate. Similar challenges were reported by Williams et al. (2011), with difficulties in securing access to schools and alternatively the authors in this case accessed children attending school clubs outside of core school hours instead (Williams et al., 2011). The problems could be due to the school's inability to incorporate external research and projects into their existing syllabus. The initial plan was to include both primary and secondary school children to cover the age range of children who suffer dental trauma. After six months of unsuccessful

attempts to identify potential schools, the head teacher at Highgate Independent School, known to a member of staff of EDH, responded with interest in participating in the study. The primary supervisor contacted the head teacher, explained the nature of the study and was put in contact with the Head of Science.

Involving the teachers throughout the planning was important to ensure the activities, materials and resources used were appropriate for the pupils. Materials designed for children and young people need to be age appropriate and as a general guide, should include only essential information, be eye catching, use everyday language and avoid jargon (Shaw et al., 2011). The teachers were receptive to the ideas from the research team and gave advice on the appropriate ways to execute the ideas successfully.

The teachers requested that pupils were not videotaped during the activities, as parents may be concerned about confidentiality. The teachers also requested that the term 'dental trauma' was removed from the consent and assent forms and information sheet as the word 'trauma' was thought to be intimidating. This was changed to ‘Injuries to teeth' instead. The term ‘dental trauma’ was also replaced with ‘Injuries to teeth’ in the Power Point presentation.

4.3.2 Presentation on dental trauma

The presentation was prepared by the researcher (EK), with input from other members of the research team. The learning outcomes were established and the presentation was prepared accordingly. The presentation was developed with content that was deemed appropriate for the young audience. Two types of presentation were prepared using Microsoft® Power Point software and Prezi (www.prezi.com), an online presentation software that uses motion zoom and spatial relationship. The teachers felt that the Power Point presentation was more appropriate for children of that age because they were more familiar with this software.

The Power Point presentation consisted of 29 slides. The text was kept to a minimum and images and photographs were included wherever possible to explain the content and keep the presentation interesting for the children

The text on each slide was kept short and simple, with large font and presented with bullet points to ensure it was comprehensible and readable. Jargon was also avoided

and terms such as ‘avulsion’, ‘crown fracture’, ‘luxation’, ‘splint’, and ‘composite’ were replaced by lay terms. The presentation was kept to 20 minutes to enable the presenter to deliver the necessary information while ensuring the children were able to pay attention throughout. The attention span of children can range from 10 minutes to an hour depending on the subject involved and their age (Caffrey, 2010). The appropriate time length for this presentation was discussed with the teacher in advance. Information about dental trauma was given to the children assuming that they had little knowledge of the topic as it is not included in their lessons about teeth. The content of the presentation were evidence based and the content about the immediate management following dental trauma was adapted from recommendations by IADT and by Andreasen et al. (2007).

The presentation started with a summary of the functions of teeth in order to highlight the importance of saving injured teeth, and starting the presentation with content that the children are familiar with was thought to be a good way to gain their attention and engagement. The prevalence of dental trauma was then discussed to signify the common occurrence and various events related to children of this age group that can lead to dental trauma. Complications of dental trauma were included to emphasise the importance of saving injured teeth by preventing or reducing complications.

Although current recommendations by IADT for actions to be taken in the event of dental trauma focus on crown injuries and avulsion, luxation injuries was also included in the presentation as luxation injuries (lateral, extrusion, intrusion) account for up to 35% of dental injuries (Hecova et al., 2010). The children were advised to go to the dentist immediately and seek dental care following any type of dental trauma, even if there was no obvious oral injury. The children were advised that the important thing to do when dental trauma happens is to keep calm and not panic so that they can take the right actions. Letting an adult (teachers, parents, care takers) know was emphasised to ensure appropriate help can be provided.

For the storage of a fractured tooth fragment, currently no best medium has been established in the guidelines and Andreasen et al. (2007) recommends keeping the fragment wet prior to reattachment. Fragment reattachment is a viable option for the treatment for crown fractures and has the advantages of being a conservative treatment, providing good and long lasting aesthetics and is cost effective (MacEdo et al., 2008). In this presentation, the children were advised that the broken part of the tooth should be kept wet and the recommended media were milk and saliva, similar

to those for avulsed teeth. This was to avoid confusion about the different options for fractured and avulsed teeth. Pictures of these medias were also included as this was thought to help the children to understand and remember the mentioned medias better. In children, using imagery has been, shown to facilitate learning and plays a positive role in deep understanding of the words the children learn (Cohen and Johnson, 2011). The children were also reassured that if they cannot find the broken fragment, there are other alternative methods (e.g. composite restorations) which the dentist can use. This was to help children understand that the dentist can provide treatment to restore the appearance and function of the tooth.

The importance of identifying primary and permanent teeth was emphasised with respect to avulsion injuries. The actions to be taken were presented in a flow chart format, to simplify the information. Andreasen et al. (2007) recommends using a real photograph to illustrate the crown and root of a tooth and the way to replant the tooth when delivering information about first aid for an avulsed tooth. An animated image of replantation was used in the Power Point presentation, as the teachers felt that clinical photographs of replantation was not appropriate, and children may be more familiar with cartoon images. The IADT website recommends that replantation can be done either by a child or an adult. Replantation of avulsed teeth by children was also recommended Sigurdsson (2013). However during the presentation in this study, the children were advised to seek help from an adult to replant teeth as the children who participated in this study were young and may not be able to do so by themselves.

A review on the suitable storage media for avulsed teeth showed that, apart from those which are specific for storage and culture purposes, regular pasteurised milk is most frequently recommended and has the best prognosis compared with other media such as saline, water or saliva (Poi et al., 2013). The recommended storage media for an avulsed tooth in the IADT dental trauma poster available for the public, is milk or saliva or keeping the tooth in the mouth. The latter was not advised in the presentation, as keeping avulsed tooth in the mouth has a risk of swallowing or inhalation of the tooth, especially in young children.

The use of a mouth guard during sports, especially contact sports was advocated as a way of preventing dental trauma. This was included as this group of children are likely to be starting contact sports soon, therefore emphasis on the use of mouth guards was important. Another type of protective device is a face mask, which is commonly used in American football and ice hockey (Bourguignon and Sigurdsson,

2009). However this device was not included in the information given to the children, as these are not popular sports in the United Kingdom for that age group.

4.3.3 Presentation session and children's participation

The aim of the project, to develop posters about injuries to teeth as a learning tool for other children was explained to the children at the outset. The children were asked if they thought teaching other people about dental trauma was important and they all agreed that it was. The researcher explained that their participation was useful in educating other people, especially children, about dental trauma. It is important for the children as research participants be informed how their contribution and information gained through their participation will be used (Kirby, 2004).

Lectures are considered the most economical and efficient method to give instructions to a large number of people so that they receive the same information at the same time (Hickman, 2011). Traditionally, the audience has a passive roles and lectures are uni-directional, however in the current study, an interactive type of presentation was developed to gain the children's interest and make the learning more fun. This was done by asking the children questions relevant to the contents of the presentation that the children could relate to and were likely to be able to answer. The children were very enthusiastic and answered all of the questions, this indicated that they were engaged and interested in the subject. Most of the answers given by the children were correct, incorrect answers were corrected and the child praised for attempting to answer. The children were asked to raise their hand if they wanted to answer a question, and the presenter randomly chose children to answer the questions as several students raised their hands to answer each question. Some of the children were also eager to share their stories about dental trauma that had happened to them, or someone they knew. This shows that the children were interested and engaged in the with the presentation and were able to relate this to their own experiences. Before concluding the presentation, a brief explanation about the activities was explained to make the children aware that their posters would be judged by their peers.

Although they were not familiar with the presenter, the children appeared comfortable in communicating with her, possibly due to the familiar setting (ie the school, teachers, classmates) however, conducting research in school setting may have the disadvantage of children's responses being affected by the presence of their teachers and friends (Marshman and Hall, 2008). The culture and customs of a school may

influence the children's attitude towards external researchers and children often perceive research tasks as school tasks and the outsider (i.e. researcher) treated like teacher leading them to behave as they would in their classrooms (James, 1998). However, children in this school had been exposed to talks and projects facilitated by outside people in the past, and this might explain their positive attitude throughout this project.

4.3.4 Classroom based activities

Phase 1 showed that children of that age (8-9 years) preferred posters as an information source about dental trauma. Although initially the teachers were open to the idea of the pupils producing posters using computers, this was not possible due to the limited number of computers. Therefore, the teachers felt hand-made posters were preferable and the pupils were also more familiar with hand drawn art work rather than computer generated graphics. No specific instructions on how the posters should look were given to the pupils to allow them to use their creativity to produce the posters. This was to encourage original ideas and allow the children to make decisions regarding the posters they produced, and have a sense of ownership of their work.

Following the presentation, the children went back to their respective classrooms to start working on the posters. They worked in groups as the research team and the teachers thought this would encourage active engagement of the children in the project and the children were familiar with working in groups during their lessons. Working in groups stimulates thinking and improves problem-solving skills (Stewart, 2014) and students who engage in group work also tend to be more satisfied with the outcome of the participation. Some studies have shown student who are involved in group work also have better learning outcomes and retention of the learned contents for a longer time compared with other learning methods (Gross Davis, 1993; Barkley et al., 2014). Those who are involved in group work also gain a better understanding of themselves as it allows people learn how other see them and this may have a positive impact on their interpersonal behaviour (Beebe and Masterson, 2012). Some disadvantages of group work are pressure from other group members to conform to the majority opinion, most people do not like conflict and try to avoid it when possible and may agree with suggestions just to avoid conflicts. One individual may also dominate the discussion and this can cause dissatisfaction among other group

members. There may also be a problem if certain group members do not contribute and depend on others to perform the task assigned to the group (Beebe and Masterson, 2012).

In the current study, the children showed considerable interest and engagement during the group work to design the posters. Although only one hour was given to them during the first session, many of the groups almost finished their posters within the allotted time. The class teachers had different methods of encouraging and supporting their class; one classroom used internet searches to find appropriate images for the children to refer to and use in the poster. Other teachers observed the pupils working and guided them when the children had questions or needed help. Another teacher spent time with each of the groups in the classroom; listened to the ideas they had and guided them accordingly. The different methods of teacher involvement could have influenced children's creativity and outcomes of the posters. Interaction with adults as well as with their peers is an important factor in developing creativity among children. Adults do have a role to act as supporters, coaches and facilitators in promoting creativity in children (Malaguzzi, 1998).

Different group dynamics and interactions were observed whilst producing the posters. As the project was carried out in their own classrooms and with their classmates, the children seemed comfortable and worked well in their teams and no distress was observed among any participants. The children asked the researchers a number of questions regarding the actions to be taken following dental trauma and the members of the research teams answered all of the questions appropriately. The questions showed that the children were keen to know the reasons behind the instructions and advice given to them. Children in this age group age group are able to identify the main points of what they have heard or read and ask questions to clarify matters that are unclear (Joule, 2014).

Handouts of the Power Point presentation were distributed to each group to be used as reference, however it was observed that not all of the groups used the handouts while others incorporated images from the handouts in their posters. This may be because some children remembered the information better than others or thought that the handouts were not helpful. The use of handouts may have influenced the outcome of the posters.

Overall the activities in this phase were carried out as planned and the children engaged well and were able to carry out the task they were assigned to successfully. Some limitations of this phase were the restriction the research team had in term of resources and time, nevertheless with input and suggestions from the class teachers, activities was planned well using the available resources and time. The level of interest and engagement the children showed during the activities illustrated that that children of that age group are able to participate in research and projects regarding issues that are relevant to them.

Following completion of the posters, the next phase was to evaluate them.

CHAPTER 5:

PHASE 3

5 Phase 3

5.1 Methodology

5.1.1 Evaluation by children

Phase 3 was completed in two parts. Firstly, the year 4 pupils exchanged their completed posters with another class and were asked to choose the best 2 or 3 posters from each class. This session was conducted by the teachers during weekly Science lesson, and was carried out by displaying the posters in the classrooms and the pupils voted by a show of hands. Nine posters were chosen in total and used in the next judging session.

The second judging session was conducted 2 weeks later at a school assembly and involved the researcher (EK). The researcher asked the children what a good poster should look like, and the children stated that they would vote for their favourite poster based on the following criteria, as shown in Table 5-1.

No	Criteria
1	Correct information (according to presentation)
2	Eye catching
3	Easy to read
4	Clear
5	Fun to read and look at

Table 5-1: Criteria for a good poster according to the children

The posters were scanned and projected onto a screen and children voted for their favourite poster by putting up their hands. The actual posters were also shown to the children one by one as well, to allow them to see the posters better. The children were allowed to vote once and were advised not to vote for their own poster, to reduce bias. The votes were counted by one teacher and EK.

5.1.2 Evaluation by the research team

The content of the 21 posters was analysed to evaluate the types of information the children had included. Ten domains were used for evaluation and these related to general information about dental trauma, immediate management and prevention of dental trauma. related to the general information about dental trauma, immediate management and prevention of dental trauma. Each poster was scored according to the number of domains noted in the posters (0 to 10). The domains are shown in Table 5-2.

No	Domains
1	Causes of dental trauma
2	Prevalence of dental trauma
3	Complications following dental trauma
4	Commonly involved teeth
5	Types of dental trauma
6	Letting an adult know following dental trauma
7	Keep broken part of the tooth or avulsed tooth in milk or saliva
8	Replanting avulsed adult tooth
9	Going to the dentist immediately
10	Use of mouth guards in sports

Table 5-2: Domains used for evaluation of the posters by the research team

5.2 Results

5.2.1 Evaluation by children

In the first judging session, three of the classes chose 2 best posters and one class chose 3 posters (n=9 in total). In the second judging session, the 3 posters with the most votes were selected out of these 9 posters. The winning poster was poster 6, which received 30 votes, the runner up was poster number 7 which received 12 votes and third place was poster number 1, which received 10 votes. All three posters are shown in Figures 5-1, 5-2 and 5-3 respectively.

The children were also asked about their experience of participating in the activities and they felt they had learned something new about dental trauma that was useful for them, the activities were fun and exciting and they would like to take part in such activities again. One pupil explained that he was happy to have made a poster that would help other children to learn about dental trauma.

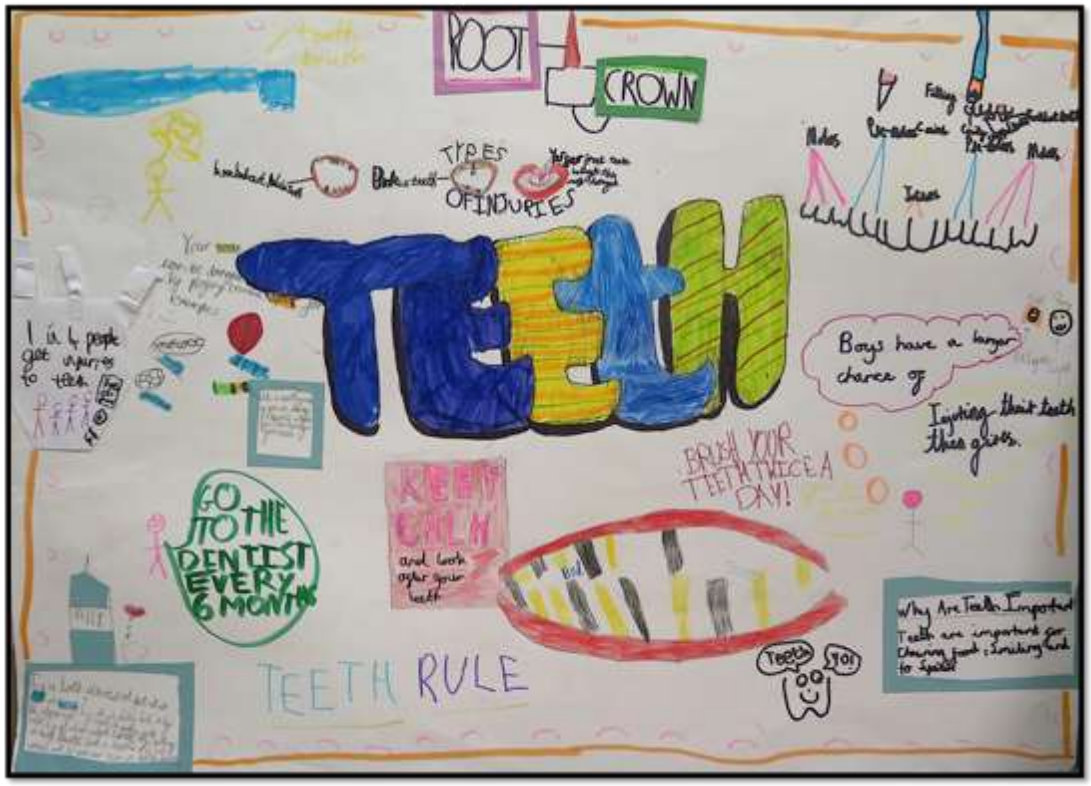


Figure 5-1: Winning Poster (Poster 6)

The winning poster was in a landscape orientation and the main features observed in the poster was the word ‘TEETH’ in large text in the centre of the poster, drawn in several colours. The information in the form of text and drawings were placed around the word ‘TEETH’.

Figure 5-2: First runner up (Poster 1)

The second placed poster was in a portrait format and had a tittle ‘TEETH ‘ at the top of the poster. Different coloured boxes were placed in the poster and a three dimensional presentation of a set of teeth was included. This poster also had several drawings of teeth. This poster was in portrait orientation.

Figure 5-3: Second runner up (Poster 7)

The third placed poster also had a tittle ‘TEETH’, but the text was smaller in size compared to the winning and runner up posters. The text was written in multiple colours and a large drawing of a tooth was included.

5.2.2 Evaluation by the research team

The top three posters (Poster 2, 6 and 14) as judged by the research team scored 8 out of the 10 domains and these posters are shown in Figures 5-1, 5-4 and 5-5. The scores obtained by each poster are shown in Table 5-3.

Figure 5-4: Poster 2

Figure 5-5: Poster 14

Poster	Causes of dental trauma	Prevalence	Complication	Commonly involved teeth	Type of injuries	Let an adult know	Keep broken/avulsed tooth in milk/saliva	Replant avulsed tooth	Go to the dentist immediately	Mouth guards	Total score
1					✓	✓	✓	✓	✓	✓	**6**
2	✓	✓			✓	✓	✓	✓	✓	✓	**8**
3	✓	✓			✓				✓		**4**
4	✓	✓		✓			✓	✓	✓		**6**
5	✓	✓					✓	✓	✓		**5**
6	✓	✓		✓	✓		✓	✓	✓	✓	**8**
7	✓			✓	✓		✓	✓	✓	✓	**7**
8	✓				✓				✓	✓	**4**
9	✓					✓	✓				**3**
10	✓	✓			✓	✓	✓		✓	✓	**7**
11	✓	✓					✓		✓		**4**
12	✓										**1**
13	✓				✓		✓	✓	✓	✓	**6**
14	✓			✓	✓	✓	✓	✓	✓	✓	**8**
15									✓	✓	**2**
16	✓	✓		✓			✓		✓	✓	**6**
17	✓	✓									**2**
18	✓	✓									**2**
19							✓			✓	**2**
20	✓			✓	✓		✓		✓	✓	**6**
21					✓	✓				✓	**3**

Table 5-3: Total score for each poster as evaluated by research team

5.2.2.1 General information on dental trauma

Figure 5-6 shows the number of posters which included general information about dental trauma. The causes of dental trauma were observed in 15 of the 21 of the posters. Causes listed were falls and trips, trampoline injuries, sports (hockey, rugby, football, horse riding) and swimming pool related accidents. Other sports that were included in some posters were boxing, baseball, and tennis. Details about the prevalence of dental trauma was observed in 9 posters, commonly involved teeth in 5 posters and 11 posters included the types of dental trauma. Only two posters had a section specifically for types of injuries, however the other posters combined the different types of injuries together with the immediate management. None of the posters included the complication of dental trauma.

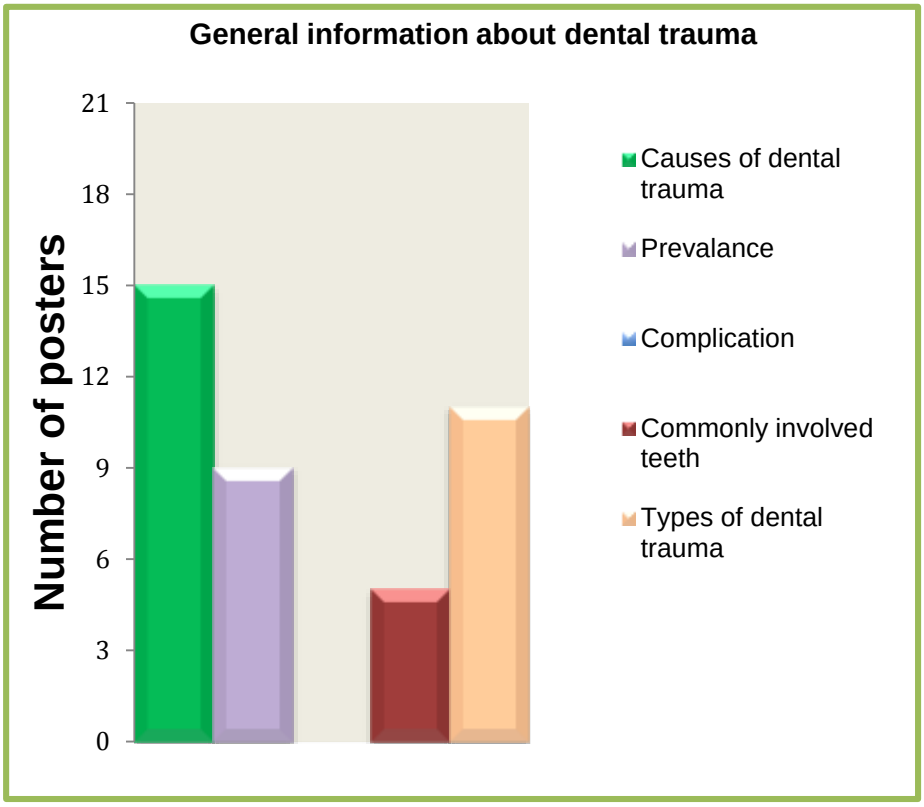


Figure 5-6: Number of posters which included general information about dental trauma

Figure 5-7 to 5-10 shows some examples from the posters showing the causes of trauma, prevalence, types of injuries and commonly involved teeth.

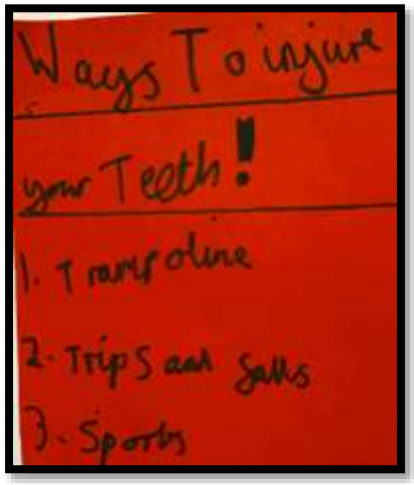


Figure 5-7: Causes of dental trauma

Figure 5-8: Prevalence of dental trauma

Figure 5-9: Most commonly involved teeth

Figure 5-10: Types of dental trauma

5.2.2.2 Immediate management and prevention of dental trauma

Figure 5-11 shows the number of posters which included information about immediate management and prevention of dental trauma. For this section, going to the dentist immediately after sustaining dental trauma and use of mouth guards were the most commonly found information (n=15 posters for both). Replanting an avulsed tooth was found in 8 posters. Keeping broken fragments of tooth and avulsed teeth in a suitable medium (milk, saliva) was found in 11 posters. Other more specific management of dental trauma was noted in some posters, including holding the crown of the avulsed teeth (n= 1) and replanting only avulsed adult teeth (n=3).

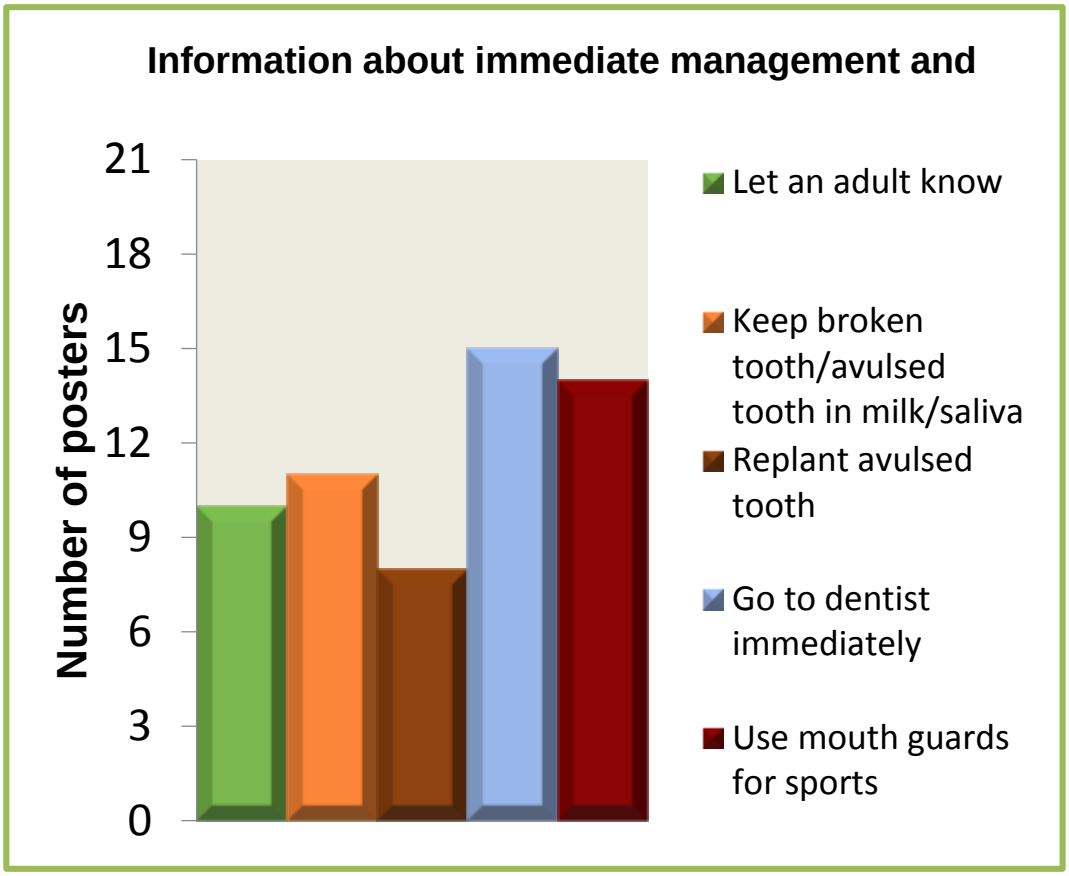


Figure 5-11: Number of posters included information about immediate management and prevention of dental trauma

An example of details about immediate management of dental trauma is shown in Figure 5-12.

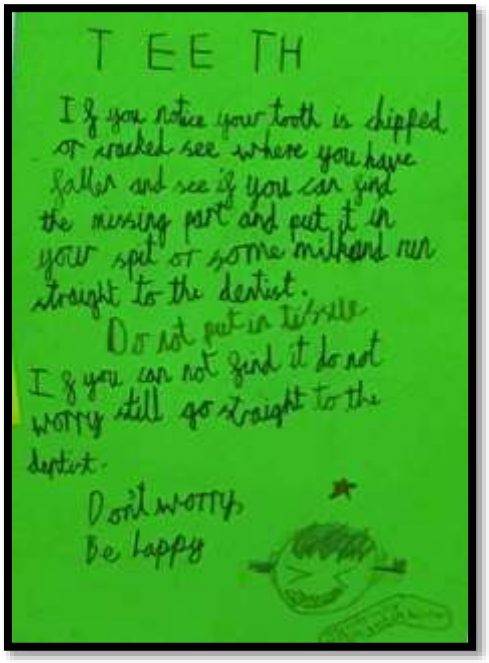


Figure 5-12: Immediate management of dental trauma

Use of a mouth guard was included in 15 posters and was represented with phrases like 'how to protect your teeth', 'how to stop teeth getting injured'. One poster showed the differences between wearing a mouth guard and not wearing one.

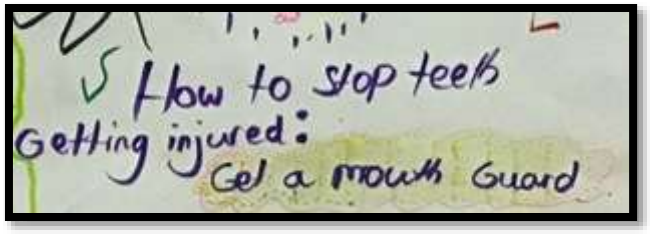


Figure 5-13: Use of mouth guards in sports

Other more general information besides dental trauma was also included in 19 out of 21 of the posters. This information included:

1) Causes of dental caries

Many of the posters highlighted sugar and not brushing teeth as the cause of 'black' and 'bad teeth'. One example is shown in Figure 5-14.

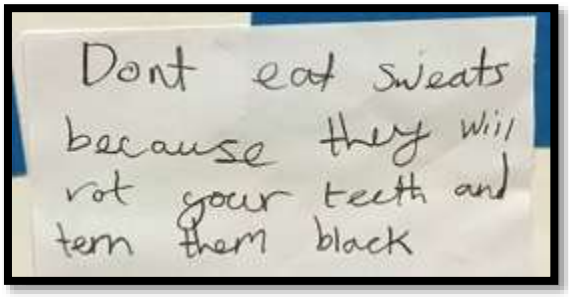


Figure 5-14: Causes of dental caries

Figure 5-15: 'Bad' teeth

2) Caries prevention

Brushing teeth for 2 minutes, not eating a lot of sugar and visiting the dentist every 6 months were found in the posters. The negative effects of cariogenic food and drinks were represented with the drawings of coca cola, Ribena, Lucozade and Haribo sweets (Figure 5-16) and placing a cross mark on them indicated that these should not be consumed.

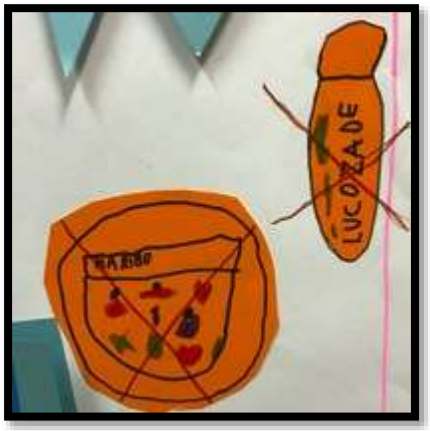


Figure 5-16: Prevention of dental caries

3) Fluoride

Advice regarding use of fluoride was included in one of the posters and was represented as a chemical found in water, which helps teeth (Figure 5-17).

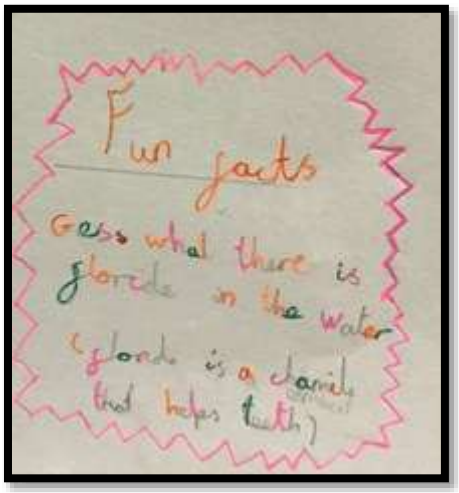


Figure 5-17: Role of fluoride

4) Function of teeth

Eating, smiling and speaking were listed as important functions of teeth as shown in Figure 5-18.

Figure 5-18: Function of teeth

5) Structure of the teeth

One poster had an image of a tooth and the structures were labelled with enamel, dentin and pulp (Figure 5-19)

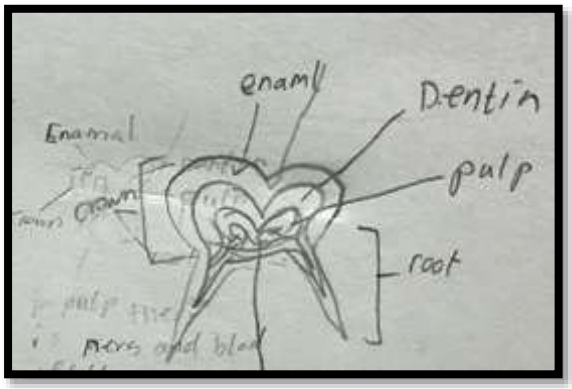


Figure 5-19: Structure of teeth

6) Function of braces

One poster described the function of braces and the types of braces that can be used (Figure 5-20).

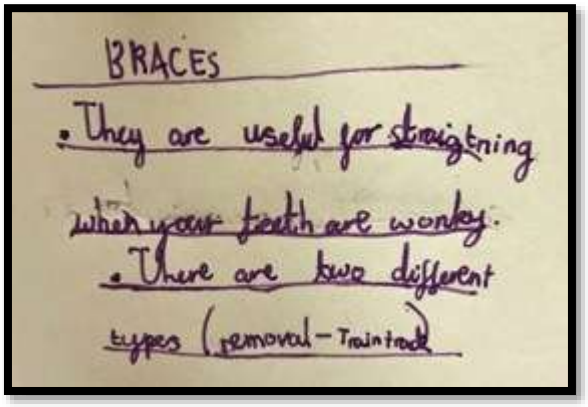


Figure 5-20:Functions of braces

7) Role of the dentist

The role of dentist was included in one poster and this was listed as 'check our teeth', 'give recommendations', 'help set teeth straight again', 'help look after our teeth' and 'teach us about teeth'.

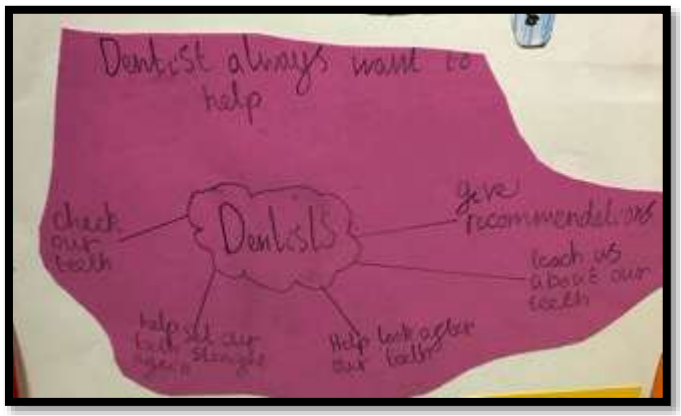


Figure 5-21: Role of dentist

8) Drawings of 'bad' mouth and 'good' mouth

Drawings of a 'bad' mouth and a 'good' mouth were included in one of the posters. The 'bad' mouth was represented with drawing of dark and black teeth, while the 'good' teeth was represented as being the same colour without any 'black' teeth (Figure 5-22).

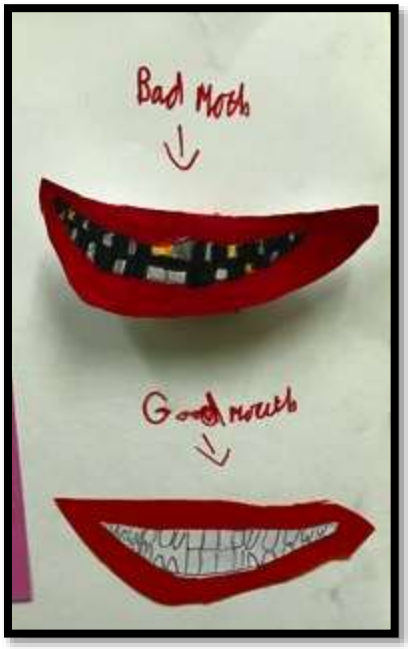


Figure 5-22: 'Bad mouth' *vs* 'Good mouth'

9) Types of teeth

Types of teeth (incisors, canines, premolars, molars) were included in two posters. One example is shown in Figure 5-23.

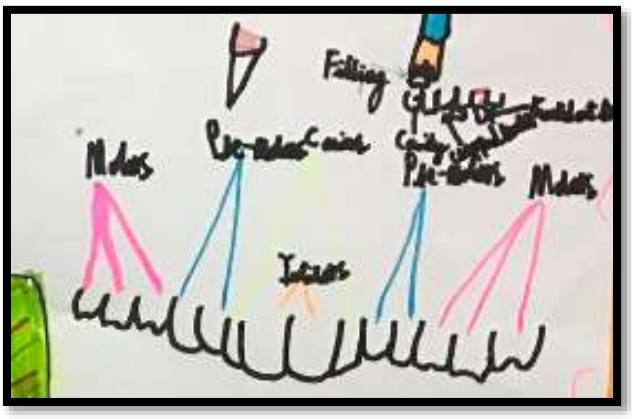


Figure 5-23: Types of teeth

10) General advice

Advice with phrases including 'sweet and fizzy drinks are bad', 'look after your teeth', 'teeth are important', 'keep calm if you injure your teeth' and 'brush your teeth' were included in several posters. One poster had a storyline about a person who injures his tooth whilst boxing and his tooth was saved and he was happy because he went to the dentist immediately. Some of the drawings found in the posters were of teeth, milk cartons, fizzy drinks, toothpaste, toothbrushes, and different types of sports. One poster had a poem written as 'Sticks and stone may break my bone but my dentist will help me'.

Nineteen of the posters had interactive elements like questions and answers, quizzes, word searches, crosswords, conundrums and windows which reveals fact underneath. Among the interactive elements, question-answer format was commonly found in the posters. Some examples of the interactive elements are shown in Figure 5-24 to 5-29.

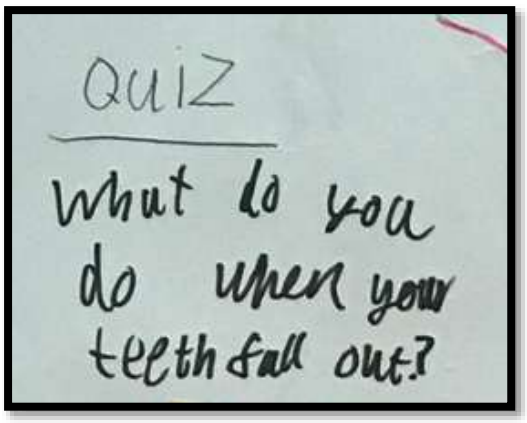


Figure 5-24: Quiz

Figure 5-25: 'Window' with facts included underneath

Figure 5-26: Facts underneath the 'window'

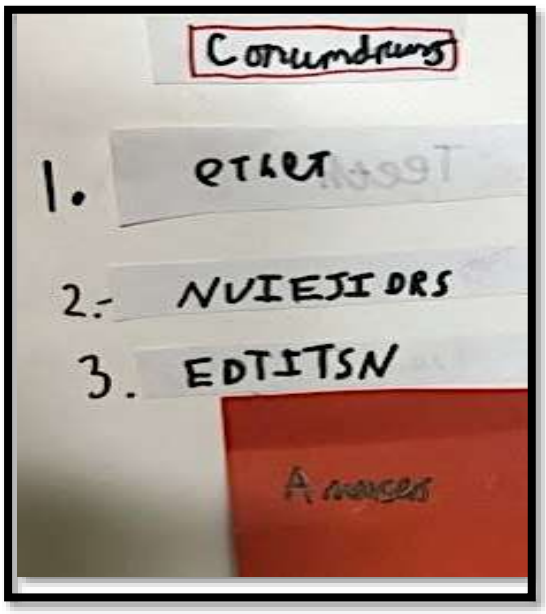


Figure 5-27: Conundrum about teeth

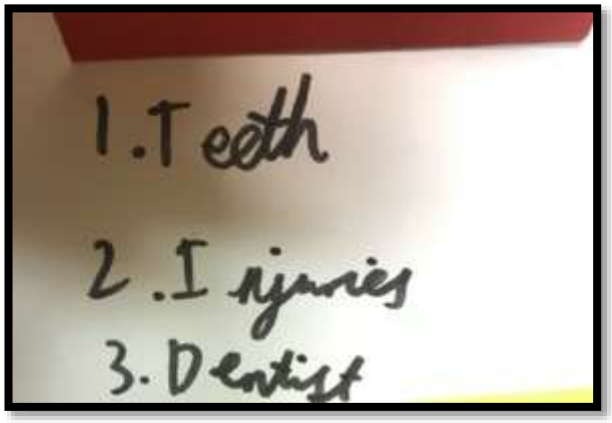


Figure 5-28: Answers for the conundrum

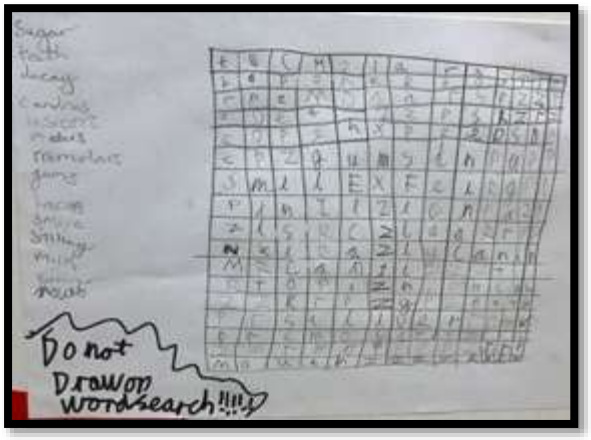


Figure 5-29: Word search

5.3 Discussion

5.3.1 Evaluation by children

The posters were evaluated by the children themselves initially. This evaluation was to allow the children to assess and appreciate the posters developed by their peers. Ideally, different groups of children could have been involved in evaluating the posters to reduce bias, however children from another year were unable to participate in this phase due to their existing school activities. The research team suggested the use of handheld clicker device (TurningPoint) for the children to vote on their favourite poster, however the teachers preferred using hand voting as it was felt a simpler way for the children to choose their favourite poster, and the children were familiar with this method.

The criteria of a good poster was discussed by the children, however the posters were voted by the children after looking at each poster only for a few minutes, therefore it is difficult to assess if the children would have considered all the criteria which were discussed, especially the posters being factually correct.

The evaluation of the posters by the children was carried out by displaying the posters to the children and immediately voted for their favourite poster. Although the children suggested some of the criteria of a good poster, it was difficult to assess if the children would have considered all the criteria which were discussed, especially if the posters were factually correct. This may have influenced the outcome of their evaluation and the children would had more time to evaluate the posters in detail if the posters were placed in the school and displayed for a longer period of time. Simple voting by show of hands was done for this session, which was a convenient and familiar method for the children, however the children's choice may have been influenced by their peer's choice. The impact of this disadvantage could have been reduced through individual evaluation of the posters, possibly through the use of simple questionnaire forms to be filled by the children.

As a token of appreciation for the children's participation, a star shaped multiple coloured highlighter with the wordings ' I'M A RESEARCHER!' were distributed to all of the children. To support the school's movement of encouraging their pupils to help children who are less fortunate, the research team donated to a charity on behalf of the five children who developed the winning poster. The children were informed prior

to the poster production that their posters would be evaluated by the their peers and a that reward would be given to the best poster, as a motivation to encourage creativity. Motivation in the form of rewards or the belief that their work is going to be evaluated is an important element of creativity (Amabile, 1996).

The perspectives and experiences of children and young people participating in research should be explored through their reflection, to evaluate the usefulness and value of including children in research (Clark and Laing, 2011). Although there has been an increase in child-centered research, there are limited reports available on evaluation of children's experiences of participating in research. Punch (2002), incorporated various task based activities in a study which aimed to explore young people's problems and coping strategies, and concluded that group discussions, especially those involving activities and exercises are fun for children. In the current study, the children gave positive feedback about their participation in the project and there were no negative comments. They may have not expressed any negative feedback about their experiences due to the presence of their peers and teachers. However, further in depth exploration of their perceptions about their involvement and the aspects that they liked and disliked about the project were not feasible due to time constraints. This would have been a good way to assess the benefits and changes to be made in planning of any similar projects in the future. The children found the research useful and provided the opportunity for them to learn about dental trauma through the presentation and the poster production. Their engagement during the activities and ability to complete the project shows that children are capable of developing educational material relevant to them and enjoyed the experience.

5.3.2 Evaluation by the research team

The posters were analysed objectively by the research team based on the content. The majority of the posters listed causes of dental trauma (n=15) probably because these were already familiar to the children and they could relate to the causes mentioned in the presentation. Some other sports that were not included in the presentation were included on the posters such as netball, boxing, cricket, tennis, diving, handball, basketball, and ice hockey. It is possible that the children associated all sports as potential causes of dental trauma, thus listed other sports as well. It is also possible that the children or their friends / siblings participated in these sports and this was why they had included them. Although the risk of sustaining dental

trauma is higher in contact sports, all sports do have a certain risk of oro-facial injuries caused by falls, collisions and contact with hard surfaces (American Academy of Paediatric Dentistry, 2013).

Going to the dentist following dental trauma was one of the most common domains found in the posters, and this was probably because this was mentioned repeatedly as one of the immediate management strategies following all types of dental injuries. The use of mouth guards was also commonly mentioned in the posters, this is possibly because some of the participants already had a mouth guard and used them during sports activities.

Replanting the avulsed tooth was only mentioned in 8 posters, possibly because of the children's unfamiliarity with such an action or they may have thought the other domains, such as going to the dentist immediately, were more important than replanting the tooth themselves. They were also told that, if the avulsed tooth cannot be replanted or if they were not sure how to do it, they could keep it in milk or saliva and bring it to the dentist. This alternative could have been one of the reasons replanting an avulsed tooth was not found in more posters.
None of the complications were described in any of the posters. This may be because it was only briefly explained during the presentation and the children may also have thought that it was not an important element to be included. However, Andreasen et al. (2007) recommended that the emotional and aesthetic long-term consequences should be emphasised as a part of raising awareness about dental trauma to the public. It has been established that the psychological, emotional, and economic consequences of dental trauma have not been a priority in public health campaigns. Therefore such campaigns should emphasise issues which can arise following dental trauma (Andreasen et al., 2007).

The majority of the posters (n=19) had content related to caries and caries prevention measures, although clear instructions were given that the posters should be about dental trauma. This may be attributed to the fact they had recently learnt about teeth and caries prevention in their science lessons. This shows that young children are eager to express their knowledge when there are opportunities to do so. Inclusion of this other information, which they had already learned, may have taken priority over some of the information about dental trauma, which was new to them.

The winning poster chosen by the children also scored the highest number of domains (n=8) in the evaluation by the research team. Almost a third of the children voted for this poster. This suggests that the children did give importance to the content when evaluating the posters. The runner up and second runner up posters chosen by the children scored 6 and 7 points respectively. However one of the posters (poster 14) which scored the highest in the research team evaluation, was not chosen as one of the top 9 posters by the children. Although this poster had a lot of vital information, the children did not favour this poster possibly due to the way the information was presented it appeared rather "condensed" and not well arranged compared with some of the other posters chosen by the children. This suggests that the children looked at presentation style as well as content, when evaluating the posters.

One interesting finding following the analysis of the posters was the inclusion of interactive elements in most of the posters. These elements are not traditionally found in health educational materials. The most commonly found interactive element in the posters produced by the children was the question format. According to the 'Guide to producing health information for children and young people', children of this age group are fond of question and answer formats when learning new information and enjoy 'amazing facts' or 'did you know' features (Joule, 2014). This suggests that health related educational materials aimed at children should include interactive elements to ensure they are child friendly. Inclusion of interactive techniques in information resources about health conditions targeted for children was also recommended by children and young people in another study (Williams et al. 2011).

The children may have thought that some of the information given to them were important while others facts were not, leading to some information more commonly included than others in the posters. They seem to have included matters that was familiar to them in some circumstances. This could be attributed to the cognitive ability where according to the Piaget's stages of cognitive development, although children aged 7-11 years old are able to perform logical thoughts, they are not able to think abstractly or hypothetically (McLeod, 2010). In the current study, the children were able to reproduce information given to a certain extent, even though most of the information they learned during the presentation was new to them and they developed the posters within a short period of time. However, guidance from adults may still be necessary to ensure the accuracy of the information they produce.

The next stage was to see what other children thought about the dental trauma posters developed by the children. To determine this, the posters were displayed for children attending the Paediatric Dentistry department at the Eastman Dental Hospital.

CHAPTER 6:

PHASE 4

6 Phase 4

6.1 Methodology

6.1.1 Subjects

Patients who were attending the Paediatric Dentistry department at the Eastman Dental Hospital.

6.1.2 Inclusion criteria

Patients above 8 years old and able to understand and read English.

6.1.3 Exclusion criteria

Patients with learning disabilities and who were unable to understand English or the nature of the questionnaire.

6.1.4 Modification and displaying of posters

The winning poster that was chosen by the children in phase 3 (Poster number 6), and one of the posters which obtained the highest number of domains (Poster number 2) in the research team evaluation, were modified using Microsoft® Power Point software to enhance the readability and clarity of the posters. The colours used in the posters were retained where possible, and some of the original drawings of the images were incorporated into the modified posters. Text and drawings deemed unclear were replaced appropriately. The language and grammar were checked by the research team and corrected accordingly. These posters were deemed to have appropriate and relevant information about dental trauma. The content of the posters and the format they were presented in are summarised in Tables 6-1 and Table 6-2, classified as having been provided in text only, images (drawings, pictures) only and text with images.

The readability of the posters was tested using the Flesch Reading Ease and Flesch-Kincaid grade level analyses. Poster 6 scored 75.8 for the Flesch Reading Ease and

grade level 3.6 for the Flesch-Kincaid Grade level, this is equivalent to grade 4 to 5 in the UK. Poster number 2 scored 98 for the reading ease test and 1 for the grade level. The portrait orientation of poster number 2 and landscape orientation of poster 6 were maintained. Both posters were printed on waterproof size A1 paper and displayed in the waiting room of the Paediatric Dentistry department on a wall where both posters could be clearly seen.

Format	n	Content
Text only	9	Management of crown fracture Management of avulsed tooth Causes of dental trauma Prevalence of dental trauma Functions of teeth Role of dentist List of sports Tell an adult and go to the dentist Take care of teeth
Images only	5	Sugary drinks (Diet coke, Ribena, Coke) 'Bad' *vs* 'good' mouth Milk
Text attached with images	1	Use of mouth guard in sports

Table 6-1: Format of content provision of poster number 2

Format	n	Content
Text only	6	Management of avulsed tooth Functions of teeth 'Brush teeth twice a day' 'Look after your teeth' 'Keep calm and look after your teeth' 'Teeth rule'
Images only	8	Tooth brush Types of teeth Types of dental trauma (knocked out, broken/chipped) Example of bad teeth Tooth Crown and root of tooth Milk
Text attached with images	6	Prevalence of dental trauma List of sports Use of mouth guard in sports Go to the dentist every 6 months Boys have more injuries than girls Most commonly involved teeth

Table 6-2: Format of content provision in poster number 6

6.1.4.1 Modification of Poster number 2

Drawings of ‘Diet coke’, ‘Coke’, ‘bad’ mouth *versus* ‘good’ mouth’, ‘Ribena’, ‘tooth’, and ‘Milk’ found in the original poster were incorporated into the modified version of the poster. The position of the drawings and the text were maintained, except for the answer box for the conundrum, which was moved to the bottom in the modified poster.

The original poster had a drawing of a mouth guard; however it was felt that this drawing was unclear, so it was replaced with a photographed image of a mouth guard. This poster had two interactive elements; a conundrum and a word search, with flaps covering the answers for both. The flaps were not included in the modified poster, as there was a difficulty in incorporating this into the printed poster. Font size 11-12 and chalkboard style were used to replace the handwritten text found in the original poster for clarity and to improve readability. Minor changes was made to the content observed in the poster. The changes made are shown in Table 6-3 and the modified version of poster number 2 is shown in Appendix 10 and included on the CD-ROM attached.

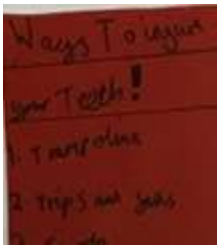
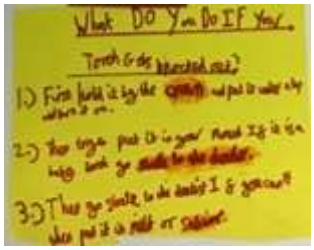
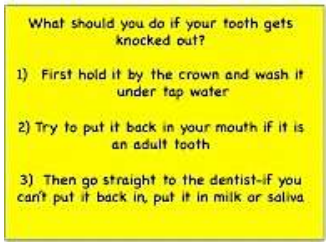
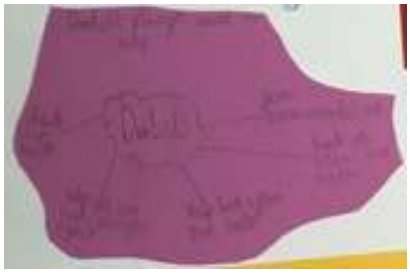
Original Poster 2	Modified Poster number 2
	
	
	
	
	

Table 6-3: Modification of Poster number 2

6.1.4.2 Modification of Poster number 6

For this poster, the title, the word ‘TEETH’ in the middle of the poster was retained. Drawings of types of injuries, a set of teeth with the upper four front teeth circled, and a smiling tooth found in the original poster were retained and used in the modified poster. Text saying ‘TEETH RULE’ and ‘BRUSH YOUR TEETH TWICE A DAY!’ were also retained and incorporated into the modified poster.

A drawing of a tooth brush was replaced with an computerised image of a toothbrush to show a clearer image. Drawings of a tooth showing the crown and the root, types of teeth and stick men were replaced with computerised drawings. Drawings of a rugby ball, football, cricket ball and bat were replaced with animation images to represent these objects, as the original drawings were small and unclear. The changes made are shown in Table 6-4 and the poster itself is included in Appendix 11 and on the CD-ROM attached.

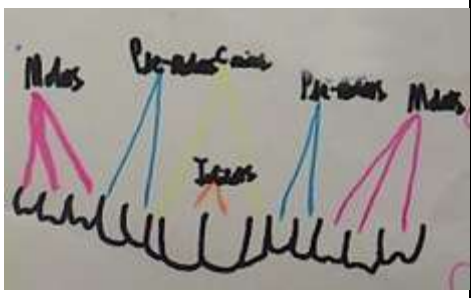
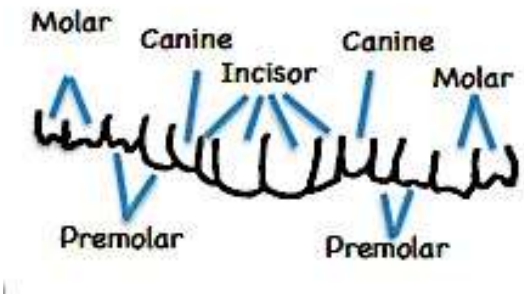
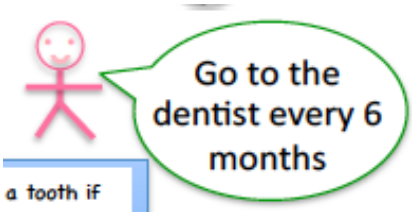
Original poster	Modified Poster number 6
	
	
	

Table 6-4: Modification of Poster number 6

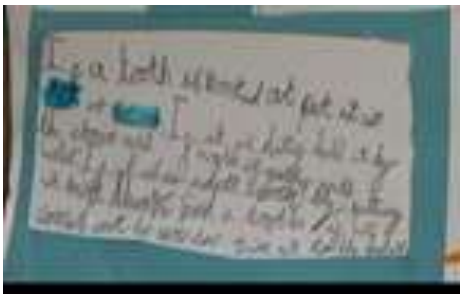
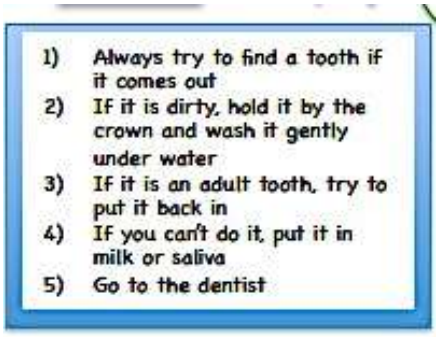
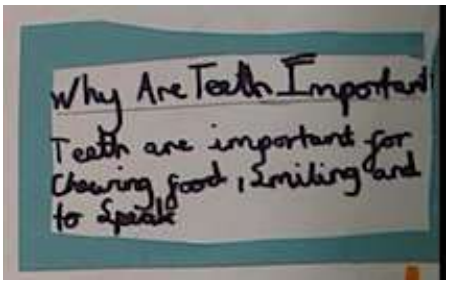
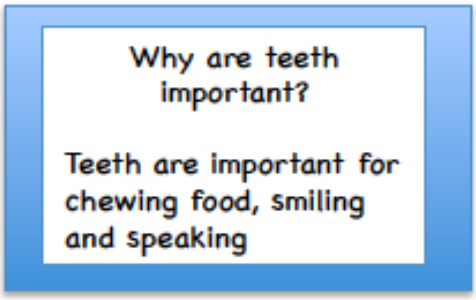
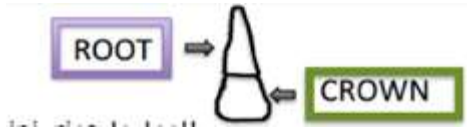
	
	
	
	
	

Table 6-4: Modification of Poster number 6 (Continued)

Both posters were displayed in the waiting area of the Paediatric dentistry department clinic for 3 weeks, on the notice board near to the seating area of the waiting room. The modified version of poster number 2 was labelled as POSTER 1 and poster number 6 was labelled as POSTER 2. For discussion purpose in the next sections, poster number 2 will be referred as Poster 1 and poster number 6 as Poster 2. Figure 6-1 shows how the posters were displayed in the waiting room.

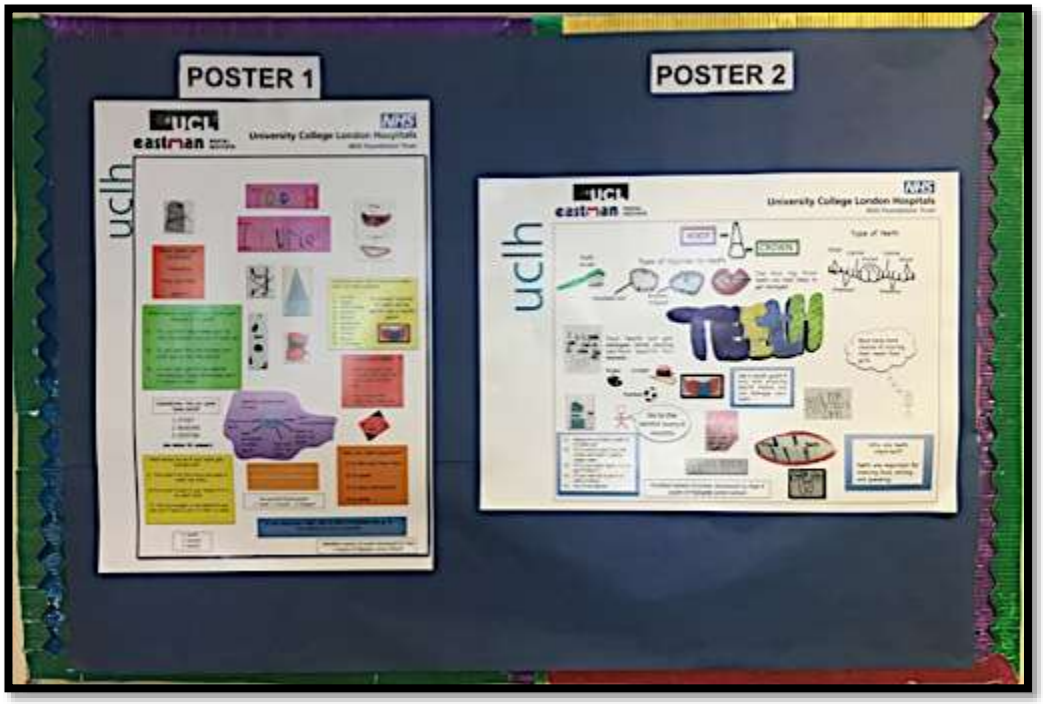


Figure 6-1: Displaying of the posters in the Paediatric Dentistry department's waiting area

6.1.5 Questionnaire development and piloting

The questionnaire was developed in order to:

(i) Evaluate children's preference between two posters about dental trauma and the reasons for their preference

- Question 1: A tick box was provided for the participants to indicate their preferred poster
- Question 2: Was an open ended question asking the reason for their preference

(ii) Evaluate the learning outcomes of the posters

- Question 3: Was an open ended question asking the participants to list 2 things they had learned from the posters

Several drafts of the questionnaires were developed. The questionnaire was also registered with the Clinical Governance Committee of the Eastman Dental Hospital. The readability of the questionnaire was evaluated using the Flesch-Kincaid readability test via Microsoft® Word. The score for the Flesch reading ease was 92 and 2.6 for the Flesch Kincaid Grade test. This questionnaire was therefore deemed suitable for children age 8 years and above. The age of the participants and their gender was also included in the questionnaire to evaluate the outcome of the questionnaires according to these two variables. The questionnaire was piloted with 10 participants, and they were asked if they understood the nature of the questionnaire and if they wished to suggest any changes. There were no comments made about the design and layout of questionnaire, and all the participants understood the questionnaires, therefore no changes were made. The average time required by the participants to look at the posters and complete the questionnaire was 9 minutes, ranging from 6 to 14 minutes The responses to the questions given by the participants were checked by the researcher, to ensure the participant had answered all questions appropriately.

6.1.6 Questionnaire distribution

Potential participants were identified by the researcher from the clinic's daily patient list. The parents and children were approached in the clinic's waiting area and verbal consent for participation was taken from the parents and the children. The children looked at the posters and completed the questionnaire while waiting for their appointment or after the appointment. The researcher emphasised that the questionnaire should be completed by the children and not the parent. Most participants completed the questionnaire before their appointment time. A number of the parent asked further questions about the poster and commented on the posters as well.

6.2 Results

6.2.1 Demographics

A total of 104 children were approached to participate in this research. All parents agreed for their children to participate, however four of the children did not want to take part. One hundred children consisting of 57 females and 43 males, were therefore included in this phase. The mean age of the participants was 11 years (range 8-15 years).

6.2.2 Questionnaire Analysis

6.2.2.1 Question 1 – Preference between Poster 1 and Poster 2.

The participants' responses were transferred to Microsoft® Excel software version 14.5.0 and SPSS version 24. Simple descriptive analysis was carried out for question 1 for the respondents' preference between the two posters displayed. Overall, poster 2 was preferred by a higher percentage of respondents (55%), compared which poster 1 was (45%) (Figure 6-2). Sixty per cent of the female respondents preferred Poster 2 (Figure 6-3). Among the male respondents, there was equal preference for the posters; 51% for poster number 1 and 49% for Poster 2.

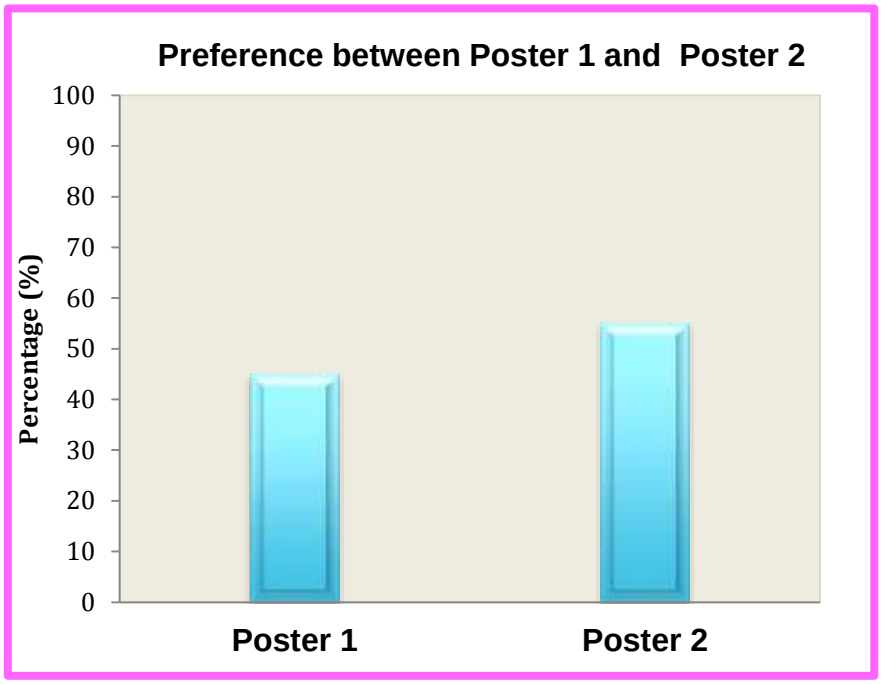


Figure 6-2: Preference between Poster and Poster 2

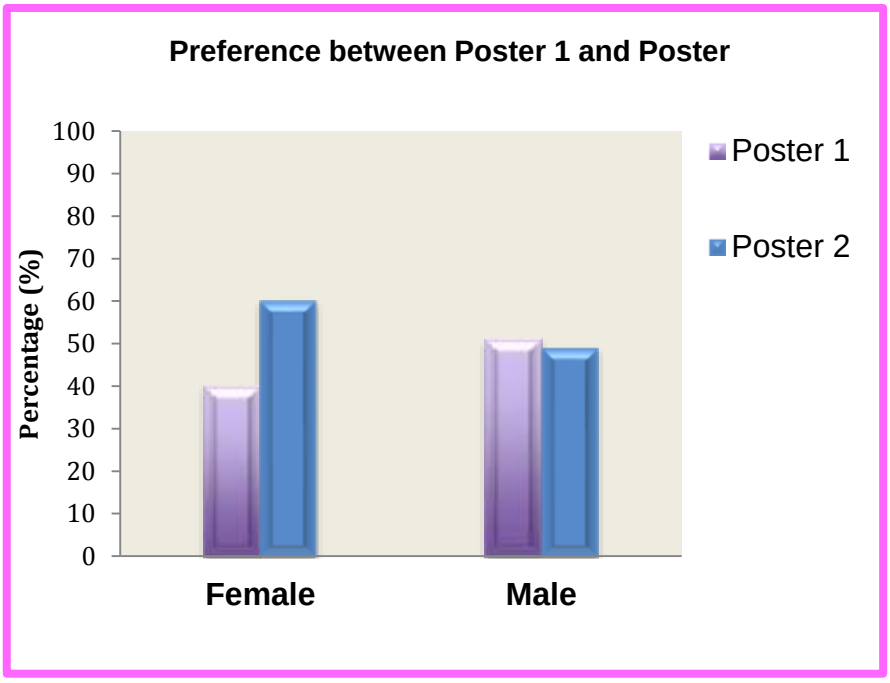


Figure 6-3: Preference between Poster 1 and Poster 2 according to gender

The data was analysed according to two age groups, group 1 (8 to 11 years old) and group 2 (12 to 15 years old). Figure 6-4 shows the preference between the posters according to the two groups. In group 1, 68% of the respondents preferred poster 2 (68%), while in the second group, poster 1 was more popular (63%). The significance

between the age groups and their preference was tested using Chi- square test and the *p*-value was 0.02, suggesting a statistical significance.

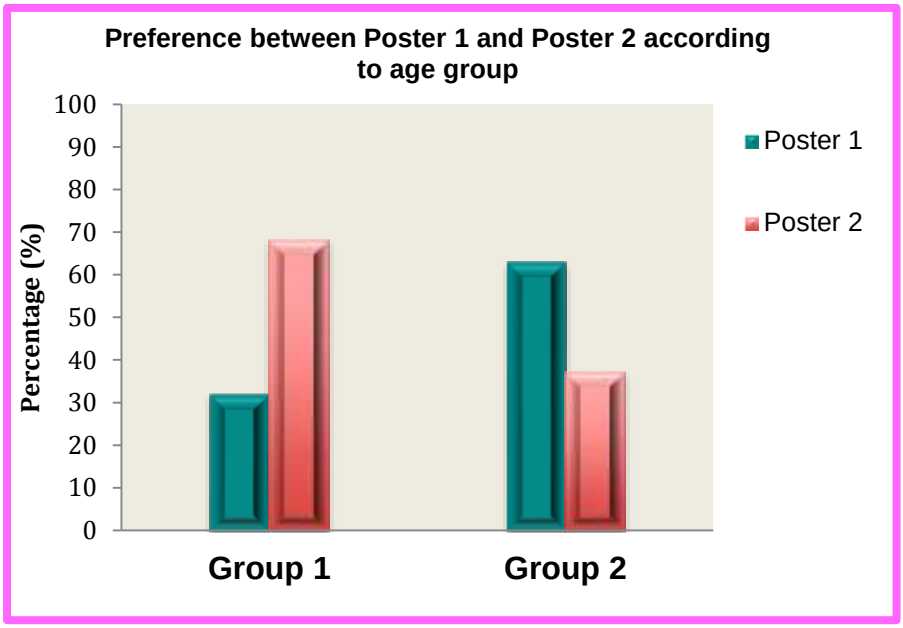


Figure 6-4: Preference between Poster 1 and Poster 2, according to age groups

6.2.2.2 Reason for the preference of posters

For this question, the number of reasons the participants were expected to write was not stated in the questionnaire, therefore, some of the respondents wrote more than one reason. A total of 120 responses was gathered from the 100 questionnaires. The responses were transferred to Microsoft Excel® spread sheet and, following a thematic analysis, six themes were identified (Table 6-5). The analysis of all the themes and relevant subthemes and the number of responses (n) in each theme are discussed below.

No	Theme
1	Information
2	Design
3	Readability
4	Interactive elements
5	Preference for specific information in the poster
6	Others

Table 6-5: Themes identified for reasons for preference of posters

6.2.2.2.1 Information

There were four subthemes identified in this theme. A total of 40 out of the 120 responses were related to this theme and the comments related more to poster 2. Table 6-5 shows the subthemes, number of responses (n) related to this theme and the examples of quotes for each poster.

Sub-theme	n	Quotes
More information	31	**Poster 1 (n=9)**
		"It states a lot of fun facts and gives different advices in case something bad happens to your teeth in accidents. (15 years, Male)
		Poster 2 (n=22)
		"More information, help to learn about teeth" (8 years, Female*)* *"It tells more about what to do if you injure your teeth*" (9 years, Female)
Detailed information	5	**Poster 1 (n=2)**
		"Easy to read, more appealing, shows more detailed information" (12 years, Female)
		Poster 2 (n=3)
		"More useful and detailed information" (12 years, Female) *"It explains in more detail what teeth are for and what to do to save them"* (11 years, Male)

Table 6-5: Theme 1- Information

Interesting information n=2	2	**Poster 1 (n=1)** *"Has interesting facts"* (8 years, Male) **Poster 2 (n=1)** *"Because it gives you interesting facts about teeth"* (11 years, Female)
Scientific	2	**Poster 2 (n=2)** *"It has more scientific facts and statistics about teeth"* (11 years, male)
Total (n)	40	

Table 6-5: Theme 1- Information (Continued)

6.2.2.2.2 Design

Forty three responses regarding the images, layouts, colour and general comments about the appearance or character of the posters were identified under this theme. The subthemes related to the design of the posters and example of quotes are shown in Table 6-6.

Sub-theme	n	Quotes
More pictures	8	**Poster 2 (n=8)**
		"It got more pictures and drawings and the other one is boring" (13 years, Female) *"It has more pictures and more eye catchy"* (15 years, Female) *It stands out more and has more photos and not a lot of text* (13 years, Male)
More diagrams	3	**Poster 2 (n=3)**
		"It has a lot of details and diagrams to show what it is trying to describe" (12 years, Female)
Cool	1	**Poster 2 (n=1)**
		"It looks cool' (13 years, Female)
Nice	5	**Poster 1 (n-1)**
		"More nicer in display" (8 years, Female)
		Poster 2 (n=4)
		"It is nicer to look at, the other poster is too neat" (11 years, Female)
Organised	3	**Poster 1 (n=3)**
		"More organised" (14 years, Male) *"I like how the text are in boxes. It looks organised"* (15 years, Female)

Table 6-6: Theme 2- Design

Colourful	14	**Poster 1 (n=11)**
		"Because it is brighter and grabs my attention as opposed to poster 2" (13 years, Female) *"It is more catchy with bright colours and also has more information"* (13 years, Male) *"It is more eye catching and colourful"* (12 years, Male)" *"It looks more friendly and colourful"* (12 years, Male)
		Poster 2 (n=3)
		"I like the colours they used" (9 years, Male)
Layout	2	**Poster 1 (n=1)**
		"Layout is better and better colour" (11 years, Female)
		Poster 2 (n=1)
		"Landscpace style is better" (13 years, Female)
Neat	2	**Poster 1 (n=2)**
		"It is neat and easy to follow" (13 years, Female)
Friendly	1	**Poster 2**
		"It looks more friendly and colourful" (12 years, Male)
Attractive	2	**Poster 1 (n=1)**
		Colourful and attractive" (8 years, Male)
		Poster 2 (n=1)
		"It is more attractive" (13 years, Female)
Total (n)	43	

Table 6-6: Theme 2- Design (Continued)

6.2.2.2.3 Readability

Nine of the responses were related to the readability of the posters, the preferred posters were discussed as either easy to read t or they were clearer. Two subthemes were identified, as shown in Table 6-7.

Sub-theme	n	Quotes
Easy to read	2	**Poster 1 (n=1)**
		"Easy to read, more appealing, shows more detailed information" (12 years, Female)
		Poster 2 (n=1)
		"Bigger, easy to read , more eye catchy , large text for teeth" (10 years,female)
Clearer	7	**Poster 1 (n=4)**
		"It has more clearer information" (12 years, Female) *"Clearer and I understand it more"* (12 years, Male) *"I like this poster because it explains more and I understand more than the other one"* (10 years,Male)
		Poster 2 (n=3)
		"The information given in this poster is a bit more clear and has more facts" (11 years, Female) *"It is more visual and easier to* understand" (11 years, Male)
Total (n)	9	

Table 6-7: Theme 3- Readability

6.2.2.2.4 Interactive elements

Six respondents chose their preferred poster because the poster contained interactive elements such word search, conundrums and questions. Below are the subthemes and the related comments.

Sub-theme	n	Quotes
Word search, conundrums, games	4	**Poster 1 (n=4)**
		"I like it more because it got word jumble and it is a little more amusing" (8 years, Female) *"It states a lot of fun facts and gives different advice in case something bad happens to your teeth in accidents. I also like the word search"* (11 years, Female) *"It has games and facts on it"* (11 years, Female)
Questions	2	**Poster 1 (n=1)**
		"There are more information and has some questions which grabs the reader's attention" (13 years, Male)
		Poster 2 (n=1)
		"Poster 2 displays many facts and expresses a couple of questions which makes the readers think" (13 years, Male)
Total (n)	6	

Table 6-8: Theme 5- Interactive elements

6.2.2.2.5 Preference for specific information in the poster

Ten responses suggested that the participants preferred one poster more than because the poster had specific information or elements. Poster 1 was preferred because it contained information on prevention of dental trauma (n=1), immediate management of crown fracture (n=1) and the causes of dental trauma (n=4). One

respondent preferred poster 1 because it had less child handwriting. Below are the quotes in this section associated with poster 1.

"It tells how you should protect your teeth in sports" (13 years, Male)

"Colourful and less child handwriting for me to try to decipher" (15 years, Male)

" I like this poster because it tells you about what to do if you tooth is chipped" (8 years, Female)

"Tells how you can injure your teeth" (9 years, Female)

Poster 2 was preferred by some participants because it portrayed examples of 'bad' teeth (n=1) and the word 'TEETH' was big and colourful (n=1). One respondent discussed that the poster shows a lot "good things for teeth". Below are the quotes n this section associated to poster 2.

"Example of bad teeth and has solutions to bad teeth" (10 years, Female)

"They have a lot of good things you can do for your teeth (11 years, Male)

"The word teeth is big and colourful. It is the first thing people notice" (9 years, Female)

6.2.2.2.6 Others

Twelve of the responses were very general and no further elaboration was given. Poster 1 was thought to be more professional (n=1) and creative (n=1). Two respondents related their previous experience to the poster.

"It is more professional" (15 years, Male)

"It gives more information and it is more creative" (13 years, Male)

"This happened to my teeth , this poster tells most about what happened to my teeth" (12 years, Male).

Poster 2 was described as “eye catching” (n=5),and more appropriate for children (n=3),

“It is more eye catching” (12 years, Male)

“It is more colourful , and better for younger children” (13 years, Male)

6.2.2.2.7 Reason for preference according to posters

The main reasons for the participants’ preference and other reasons that were exclusive to each of the poster are summarised below.

6.2.2.2.7.1 Poster 1

One of the main reason for preferring this poster appeared to be because it was more “colourful”. Other reasons included: a better layout, less child hand writing, was professional and creative. This poster was also preferred because it had information about prevention of dental trauma and management of crown fracture. Previous experience of dental trauma was also referred to for this poster.

6.2.2.2.7.2 Poster 2

One of the main reasons this poster was preferred by the participants was because it has more information than the other poster, and more pictures/ diagrams. Other reasons were that the poster appeared scientific, looked ‘cool’ and friendly. The poster was also preferred by some because it had examples of ‘bad teeth’, the word ‘TEETH’ was large and it had a lot of information about good things for teeth. This poster was also thought to be eye catching and more appropriate for children. The landscape orientation of the poster was also a reason which was mentioned.

6.2.2.3 Question 3 - Please tell us 2 things you have learned from the posters

The respondents were asked to write two things which they had learned from the posters, however some of them wrote more than two answers and nine of the respondents only wrote down one response. A total of 195 responses were gathered

for this question. Four main themes (teeth, general aspects of dental trauma, management of dental trauma, and others) were identified. Findings for each themes are discussed below.

6.2.2.3.1 Teeth

Eight sub-themes related to teeth were identified, with 61 responses (Figure 6-5).

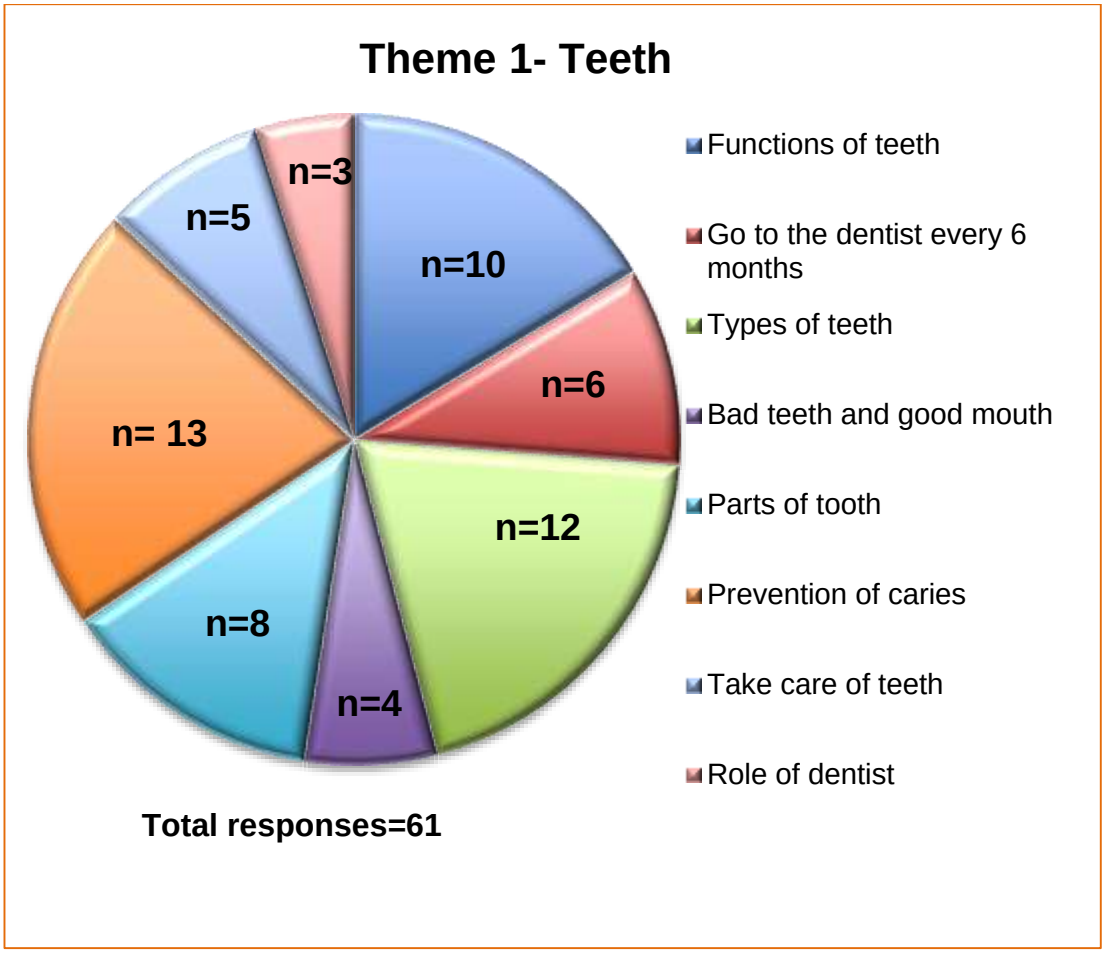


Figure 6-5: Theme 1- Information about teeth

6.2.2.3.1.1 Functions of teeth

Ten respondents discussed the functions of teeth listed in the posters as one of the things they have learned. The following quotes related this subthemes.

" Teeth are important to play instruments" (9 years old, Female)

"Teeth are important for eating speaking and smiling" (8 years old , Male)

"Teeth useful for chewing speaking and smiling, so we must take care of them" (13 years, Female)

One respondent associated having good teeth with the ability to speak confidently.

'Having good teeth makes you speak more confidently" (9 years, Female)

6.2.2.3.1.2 Go to the dentist every 6 months

Going to the dentist every 6 months, which was included in Poster 2, was listed by 6 respondents. The following are examples of the comments.

"Go to dentist every 6 months for check up" (10 years, Female)

"*Teeth need to be checked every 6 months"* (9 years, Male)

6.2.2.3.1.3 Types of teeth

Types of teeth were displayed in poster number 2, and this was noted by 12 respondents.

***"**Different types of teeth"* (14 years, Male)

"There are many types of teeth" (13 years, Male)

6.2.2.3.1.4 'Bad' teeth and 'good' teeth

Four respondents commented on this::

"What a bad teeth look like .Black and yellow" (12 years old, Male)

"Examples of how good mouth look like compared to bad one (13 years old, Female)

6.2.2.3.1.5 Parts of a tooth

Eight respondents explained that they had learned about the crown and root of a tooth.

"The two part of tooth are called root and crown" (11 years, Female)

'Where the crown and root of tooth is" (10 years, Male)

6.2.2.3.1.6 Prevention of caries

This theme was related to advice about tooth brushing and diet (e.g. sugary drinks), below are some examples of responses:

"Ribena and coke are no no" (15 years old, Female)

"Brush teeth twice a day" (8 years old, Male)

"Don't drink fizzy drinks" (8 years old, Male)

6.2.2.3.1.7 Take care of teeth

Five respondents stated they had learnt that they need to take care of their teeth:

'"You need to look after your teeth" (12 years old, Female)

"Teeth useful for chewing speaking and smiling, so we must take care of them" (8 years old, Male)

6.2.2.3.1.8 Role of dentist

Three responses were about the roles of dentist (poster 2):

"What dentist do to help care for our teeth" (12 years, Female)

"What are the stuffs dentist can do" (10 years , Male)

6.2.2.3.2 General aspects of dental trauma

The second theme identified was on the general information regarding dental trauma with six subthemes as shown in Figure 6-6. This theme had the highest number of responses (n=78).

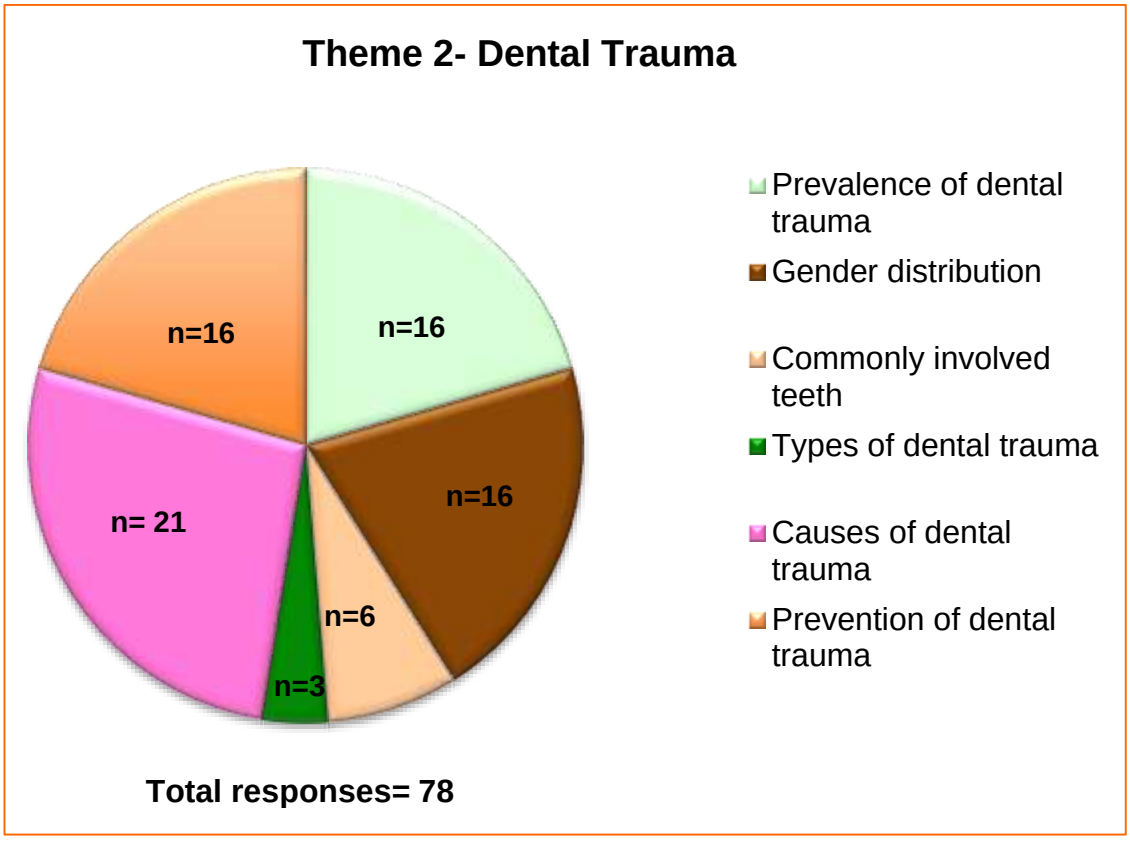


Figure 6-6: Theme 2- General aspects of dental trauma

6.2.2.3.2.1 Prevalence of dental trauma

Sixteen of the responses were regarding the prevalence of dental trauma. A description of the prevalence of trauma was noted in both posters (25% of people and 1 in 4 people) and comments regarding this included:

"25% of people have injured their tooth at some point of their life" (12 years, Female)

"1 in 4 people have experienced teeth injuries" (11 years, Male)

"1 in 4 people injure their teeth- that is a lot" (10 years, Female)

6.2.2.3.2.2 Gender distribution

Information regarding gender distribution of dental trauma (more injuries to teeth in boys than girls) was noted by 16 children, 14 of them were females and two males. Some quotes given by the children are listed below:

"Boys have more chances of injuring their teeth than girls (11 years old, Male)

"Boys more likely to injure their teeth" (9 years old, Female)

" *Teeth injuries happens more in boys than girls*" (14 years old, Female)

6.2.2.3.2.3 Commonly involved teeth

The commonly involved teeth (the upper incisors) were noted by 6 of the participants, some examples include:

"The four top front teeth are most likely to get damaged" (13 years old, Female)

"Mostly the top front teeth can be injured" (10 years old, Female)

6.2.2.3.2.4 Types of dental trauma

Three respondents noted how different types of injuries can occur, with one listing the two types of injuries that were included in Poster 2:

"Different types of injuries that can happen" (12 years old, Female)

*"Type of different teeth injuries. teeth can be chipped or knocked out" (*10 years, Male)

6.2.2.3.2.5 Causes of dental trauma

The causes of dental trauma was described by 21 respondents. Seventeen of them discussed sports as potential causes of dental trauma and another four included trampoline injuries, trips and falls as causes of dental trauma.

"You can injure your teeth when on trampoline" (8 years old, Male)

"The different sports you can injure your teeth in" (13 years old, Male)

6.2.2.3.2.6 Prevention of dental trauma

Prevention of dental trauma was described by 16 of the respondents. One respondent discussed that they need to be careful during sports activities and the remaining responses were related to the use of mouth guards during sports.

"I need to be careful when I play sports" (10 years, Female)

"When playing sports mouth guards can help protect your teeth from getting injured" (12 years, Female)

6.2.2.3.3 Management of dental trauma

A total of 49 responses were related to the immediate management following dental trauma, with 7 subthemes identified (Table 6-9).

Subtheme	n
Go to the dentist	9
Keep broken part /avulsed tooth in milk or saliva	14
Wash avulsed tooth under water	1
What to do in the event of dental trauma	9
Keep broken part/avulsed tooth and bring to the dentist	8
Tell an adult	4
Replant avulsed tooth	4
Total	49

Table 6-9: Information about immediate management following dental trauma

6.2.2.3.3.1 Go to the dentist

The first sub-theme was regarding going to the dentist when dental trauma occurs and this was listed by nine respondents. Some of the responses are listed below.

"Go to dentist if you fall and your teeth have injury" (11 years, Male)

"It is important to go to the dentist if you chip your tooth" (12 years, Male)

6.2.2.3.3.2 Keep broken part /knocked out tooth in milk or saliva

Among these sub-themes, keeping broken and knocked out tooth in milk or saliva was the most common information included as a response for this question (n=14).

"Broken teeth can be kept in milk" (14 years, Male)

"You can put broken tooth or knocked out tooth in saliva" (8 years, Female)

6.2.2.3.3.3 Wash knocked out tooth under water

One respondents listed washing knocked out tooth under water as one of the thing they have learned.

> *"If the knocked out tooth is dirty, we should wash it under water by holding the crown"* (12 years, Female)

6.2.2.3.3.4 What to do in an event of dental trauma

Nine of the respondents gave a general statement that they had learned about what to do if dental injuries occur. Examples of the responses include:

> *"What you should do if u have chipped tooth"* (13 years, Male)

> *"What to do when my tooth is broken"* (12 years, Male)

> *"What to do if your tooth get knocked out"* (11 years, Male)

6.2.2.3.3.5 Keep broken part/avulsed tooth and bring to dentist

Eight respondents said they had learned that they should keep fractured fragment and avulsed tooth and bring it to the dentist, as the dentist are able to reattach the fractured fragment and replant the avulsed tooth.

> *"You should keep knocked out tooth because the dentist can put it back in"* (9 years, Female)

> *"If you break your teeth, find the broken part and dentist can put it back on"* (8 years, Female)

6.2.2.3.3.6 Tell an adult

Four respondents stated that they had learned that they should to tell an adult immediately if they sustain dental injuries.

> "*Learnt that if I injure my teeth, I need to a adult immediately"* (9 years, Female)
>
> *"If you hurt your teeth, immediately tell adult"* (8 years, Female)

6.2.2.3.3.7 Replant avulsed tooth

Four respondents also learned that an avulsed tooth can be replanted and two of them acknowledged that adult tooth should be replanted .

> *"Tooth can come out when playing sports and we can put it back in"* (13 years, Female)
>
> *"When adult tooth and its dirty when knocked out, I should clean it with water and try to put it back in"* (12 years, Male)

6.2.2.3.4 Others

Seven of the respondents concluded that teeth are generally important and one of them stated that injured teeth can be saved. Below are the quotes related to this theme.

> *"Having good teeth is important because it has many function"* (15 years, Female)
>
> *"If tooth is knocked, it can still be saved"* (15 years, Female)

6.3 Discussion

This phase of the research was a pilot study, to assess the suitability of the posters to be used as a tool to disseminate knowledge regarding dental trauma among children. The aims of this phase were to evaluate children's preferences between the two posters and their reasons for this. The second aim was to evaluate the learning outcomes of the posters. A study by Young et al. (2014) evaluated the impact of educational posters in enhancing knowledge about emergency management of dental trauma among secondary school children, however these posters were not designed by children (Young et al., 2014) and the children's opinion about the posters were not explored. In the current study, evaluation of the effectiveness of the posters in term of increasing knowledge about dental trauma was not a focus, and will be considered in future studies.

6.3.1 Modifications of the posters and displaying

Two of the posters that were designed by the children in phase 2 were modified by the research team to improve readability and clarity of the posters. Both of the original posters had rather small fonts, therefore the text was typed in appropriate font style and size. This approach was similar to a study where hand washing posters produced by children were modified with Adobe In-design CS3 software to improve clarity and resolution in order to be displayed and used as an interventional tool (Graves et al., 2011). Microsoft® Power point version 14.5 was used in this current study as it is simple to use. The posters were printed in A1 size as it was thought that they would fit better on the notice board and would be more noticeable. Kerr et al (2001) in a study looking at the influence of poster prompts on stair use in shopping malls, found that posters smaller than A3 size was ineffective for interventional purpose and recommended using posters bigger than A3 sizes such as A2 and A1 (Kerr et al., 2001).

The issues with readability and clarity of the contents in the posters may have been avoided if computer software had been used to produce the posters instead of hand drawings. But this was not feasible within the resource constraints of resources at the school. The researcher reproduced the posters while retaining the information, design and colours of the original posters. The content, language, structure of sentences and

grammar was checked as well and corrected as this was not done at the time of the poster production.

The readability of the two posters used in this phase was assessed using the Flesch reading ease and Flesch-Kincaid grade level analyses. These measures were selected due to the simplicity and widespread use in the development of readable patient educational materials in the health care field such as nursing and pharmacy. Hendrickson et al. (2006) found that, although paediatric oral care materials are readily available, their quality and readability varies greatly. The authors recommended using readability formulas such as Flesch-Kincaid to develop more readable patient education materials in dentistry. However, Flesch-Kincaid has limitations as it is only the average sentence length and average number of syllables per word which is analysed. Other factors such as the font size, use of bold typeface, used of bullets, simplified sentences, use of pictures or diagrams also contributes to the readability of a materials (Hendrickson, 2006). The Suitability of Assessment Materials (SAM) which rates materials according to 22 items in six sections (content, literacy demand, graphics, layout and typography, learning stimulation and motivation and cultural appropriateness) and this may be used as an instrument to determining the suitability of written educational materials for the targeted audience (Doak et al., 1996).

Poster displays are a simple way to convey health messages (Montazeri and Sajadian, 2004) and health promotion posters, as an intervention, have been shown to have a positive impact on health behaviours in areas as diverse as stair climbing (Kerr et al., 2000; Olander et al., 2008), injury prevention (Pless et al., 2007) and disease awareness (Nishtar et al., 2004). To ensure that the posters were noticed by the patients attending the Paediatric dentistry department, they were displayed on the notice board used to display information regarding oral health. It has been shown that patients do read the posters displayed in practice settings although this depends on the subject of the posters. Patients also remembered the information on the posters and wanted more information about the subject (Ward and Hawthorne, 1994). However another study reported contradictory findings, with only a small number of patients reading the posters displayed in the waiting room of a general medical practice (Wicke et al, 1994). In the current study, it was observed that most of the patients attending the department did look at the posters while waiting to be called for their appointment. It has also been argued that the contents of the posters could trigger anxiety in patients and consideration should be given to the content of posters

that are displayed in waiting areas of health practices (Montazeri and Sajadian, 2004). The posters used in this current study were deemed to be child- friendly and no behaviour or comments were displayed indicate distress among the participants.

6.3.2 Questionnaire development and distribution

Several drafts of the questionnaire were developed, following discussion and input from the research team. A short description about the study was included in the questionnaire to inform the participants about the posters. Open ended questions for question number 2 (reason for their preference between the two posters) and question number 3 (two things they have learned through the posters) were used to encourage the participants to respond to the questions in their own words, and to give more freedom to express their opinion and allows them to list out things that are important to them (Ballou, 2008). However using questionnaires with open ended questions can be time consuming as participants may take a longer complete the questionnaire, and additionally data analysis can be time consuming (Mc Leod, 2014).

The inclusion criteria for this phase was children above 8 years old, as they are deemed to have the cognitive abilities to respond to questionnaires (Borgers et al., 2000). There was no upper age limit set initially, however as this project was carried out in the Paediatric dental department, children up to 15 years old were included. This allowed for an opportunity to assess the suitability of the posters in children much older than the children who developed the posters.

All parents agreed to their children taking part in this study, however four children did not want to take part. Two children preferred to play the video games available in the waiting room and two other children did not give a reason for their refusal. The positive response from most patients may be due to the simplicity of the questionnaire, and some of the parents commented that it was a good activity for the child while waiting to be called in for their appointment. Some parents also gave positive comments verbally to the researcher about the posters such as the posters looking and attractive and one parent thought that the concept of displaying posters developed by children was interesting.

Some of the children completed the questionnaire as they looked at the posters, whilst the majority of children looked at the posters first and then returned to their seats in

the waiting area and completed the questionnaire. A small number of the children looked at the posters and completed the questionnaires after the appointment. This may have influenced how much they remembered about the posters.

6.3.3 Discussion of results of Phase 4

6.3.3.1 Preference between the two posters

The respondents were divided into two groups according to age, to evaluate the differences between the preferences for the two posters and the reasons for this preference.

The overall results showed that poster 2 was more popular, although there was a difference in terms of the preference between the two age groups. The younger children preferred poster 2, while the older children preferred poster 1. Six main themes were identified and are discussed below.

6.3.3.1.1 Information

Information was the first theme and was commonly discussed by respondents as the reason for choosing their preferred poster. The more number of information in their preferred poster was discussed more by respondents who preferred poster 2. This poster did contain more information in the form of text and images compared to the other poster. One respondent commented that the poster 2 described more about the steps to be taken following dental trauma, although it must be noted that poster 1 included management following crown fractures and avulsion injuries. Other comments regarding the information in the posters were that the posters were interesting, useful and the information was “scientific”. It is difficult to comment on the specific components of the posters the participants were referring to, as the responses were not elaborated on. The comment on this theme do however suggest that children are receptive towards health educational materials, with facts and detailed information. The inclusion of information component of the posters as the reason for their preference suggest that children are receptive towards health educational materials with lots facts and detailed information. However the information must relevant for the intended purpose and must be presented in an age appropriate format to ensure that comprehension of the information is not compromised.

6.3.3.1.2 Design

The majority of the responses were within this theme and there were slightly more responses related to poster 1. Respondents discussed the range of colours and associated the colours to drawing more attention to the poster. The respondents may have been referring to the bright colours of the text boxes observed in poster 1. One respondent who preferred poster 2 also thought that was to be colourful and this was associated with the poster being eye catching. When designing such posters targeted for children, using a suitable range of colour may have a more positive impact on the level of attractiveness of the poster and therefore on how the posters were perceived.

Images in the posters were more commonly discussed by respondents who preferred poster 2, and this may be because this poster included more images (n=16) compared with Poster 1 (n=8). General comments given by the respondents suggested that they this preferred poster because it had more pictures or diagrams. One respondent commented that they preferred poster 2 because it had more pictures and diagrams the other poster was deemed “boring” in contrast. These comments suggest that inclusion of images makes posters more attractive to children. Visual components have been shown to be useful in engaging readers and in reinforcing messages in printed materials (Kulukuluani, 2008). Addition of images to text in heath educational materials may increase the likelihood of the materials being read (Delp and Jones, 1996). To the best of our knowledge, the impact of using visual imagery to increase to health materials among children has not been reported in the literature, however Levie and Lentz (1987) assessed the outcome of text learning with the use aid of illustrations and text versus text alone and found that children preferred stories with pictures than without pictures (Levie and Lentz,1987). The images in the posters used in this study were generally simple drawings by the children and the use of simple drawings rather than complex drawings or photographs have also been advocated by Houts et al. (2006) as they are less distractive for readers and more suitable for people with low literacy skills (Houts et al., 2006).

6.3.3.1.3 Readability

Readability has been defined in many ways. Richards et al. (1992) defined readability as “how easily written materials can be read and understood” (Richards et al., 1992) and McLaghlin (1969), defined readability as, "the degree to which a given class of people find certain reading matter compelling and comprehensible" (McLaghlin, 1992).

In the current study, responses in this theme related to clarity, comprehension and ease of reading are group under. One respondent who preferred poster 2 noted that it was easier to read the poster because it was bigger in size, although both of the poster were of the same size. It may therefore be the format (e.g. portrait vs landscape) which makes a difference in some situations. Another respondent who chose poster 1 referred to the information as being clear, therefore they understood the poster more. One respondent associated the visuals in poster 2 with the poster being easier to understand and another commented that the diagrams in Poster 2 enabled them to understand the poster.

6.3.3.1.4 Interactive elements

It is interesting to note that only six of the responses related to the interactive elements and all six of them were given by participants from the younger age group. Although interactive elements were thought to be an attractive component in the poster, the children may have given more importance to other components in the posters. However inclusion of interactive elements in materials, particularly those targeted at younger children, may be useful. Presenting information in question-answer format and problem-solution format is generally easy to understand and recalled (Adams, 2014).

6.3.3.1.5 Preference for specific information in the poster

The responses categorised in this theme indicate that the children preferred one poster more than the other because the poster gives information about a specific issue. Three participants discussed that they preferred poster 1 as the poster informed them that injuries to teeth can occur while playing sports. Poster 1 included ten different types of sports and it is possible that children who are involved in or liked the sports activities listed, found the poster more compelling compared with poster 2 which only listed three types of sports.

Other specific information identified under this theme related to the gender distribution of dental trauma (higher frequency of dental trauma in boys than girls), and prevention of dental trauma (how to protect teeth and use of mouth guards in sports) and these were included in both posters. However, the participants may have discussed these as the reason for choosing the poster because they may have not noted this information in the other poster or they liked the way this information was presented in their preferred poster.

Each poster had specific elements which the participants highlighted as the reason for their preference. One respondent commented that poster 1 had less 'child hand writing' which may be due to the fact that the other poster had inclusion of some original text taken from the actual poster. This text was thought to be easily read and clear thus was retained. However the respondent was an older participant (15 years old), thus may have disliked the handwriting of a younger child. Another respondent discussed that tittle of the poster 'tooth injuries' described the message of the poster, in comparison with the other poster which only had 'Teeth' as the title, the respondent may have thought that this was not specific to the content of the poster.

One of the features noted in poster 2 which was liked by the respondents was the word 'TEETH' which was positioned at the centre of the poster in large and colourful text. One respondent commented that this word is the first thing people would notice, probably because this particular word is much larger than the rest of the text in the poster.

6.3.3.1.6 Others

Responses which were thought to be more general were categorised under this theme. Two respondents discussed that they preferred poster 1 because the poster described something which had happened to them before. Although both of the posters were about injuries to teeth and the actions to be taken following the injury, poster 1 had information regarding management of crown fractures, therefore presumably the respondents experienced crown fracture injury and thought this poster is more relevant to them. Some respondents also thought that poster 2 was more suitable for younger children, however no reason for this was elaborated. This could be related to some of the other reasons already discussed, such as the design of the poster with more pictures and diagrams.

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6.3.3.2 Learning outcomes

Participants were asked to write down two things they had learned in order to evaluate the learning outcomes of the posters. As the posters had a lot of information, it was thought to be reasonable for the participants to list two things instead of one but asking for more items would potentially have affected the completion rate of the questionnaire.

The majority of the responses related to information which was either in the form of images or text associated with an image (e.g. keeping the fracture fragment and avulsed tooth in milk and saliva). As well as increasing attention to the material and the messages portrayed, images are also useful to help people comprehend the information, increase the recall of messages and increase the chances of people adhering to a message (Houts et al., 2006).

A number of themes were identified in relation to learning outcomes, as described below.

6.3.3.2.1 Teeth

Both of the posters portrayed general information about teeth which was not related to dental trauma and this resulted approximately a third of the responses being related to this type of information. Respondents may also have made comments about prevention of caries, consumption of sugary drinks and the role of the dentist because

they were in the dental hospital setting. Therefore, they may have thought that it was more appropriate to list this information.

6.3.3.2.2 General aspects of dental trauma

Responses that were related to the general information about dental trauma was categorised under this theme. Among all the subthemes, causes of dental trauma had the highest number of responses (n=21) followed by prevalence (n=16), gender distribution (n=16) and prevention of dental trauma (n=16). It was noted that this information was included in both of the posters and this may have led to the participants thinking that this information was most important. They may also have remembered it better because they would have read the same type of information in both posters.

Sports in general are familiar activities that children can relate to. Ten different types of sports were listed in the posters and it is possible that the children were not aware that some types of sports can result in dental trauma, therefore they listed this as one of the things they had learned. Use of mouth guard in sports were discussed in 16 responses and 14 of these were by participants in the younger age group. Children in this age group may have only just started to get involved in contact sports and mouth guards may have been new information to them. Alternatively, they may have been told about mouth guards at school or in dental appointments and this may therefore have been reinforcement of information they already know.

It is interesting to note that majority of responses related to gender distribution of dental trauma were given by female participants. It is possible that the participants may have associated dental trauma as a negative event, and they may have thought that the more common occurrence of the event in the opposite gender may have been an interesting fact for them. Girls may also be more risk averse in their activities and this could also have influenced the responses.

6.3.3.2.3 Management of dental trauma

Almost a quarter of the responses were related to the immediate management of dental trauma. This was lower than the other two themes discussed above, it had been assumed that information related to this theme would have been included more

commonly as this information was new to the children. This was possibly because the posters did not focus solely on this topic and included many information also, especially in poster 2. Their comprehension regarding this subject may also have influenced the responses. The highest number of responses in this theme was regarding storage of fractured fragment of teeth or avulsed tooth in milk or saliva. This information was included in both posters and the information was also supplemented by pictures of milk carton in both poster; this familiar image of milk may have led to enhance retention of information.

6.3.3.2.4 Others

The majority of the participants included specific information which were observed in the poster, however a small number of responses (n=7) were made up which were general statements or conclusions the participants made based on the poster. The important of taking care of the teeth and having good teeth was noted, as was the reflection that if teeth are traumatised, they can be saved. The posters therefore had a positive impact and participants did understand the message conveyed in the posters.

CHAPTER 7:

SUMMARY

7 Summary

Children were involved throughout this child centred study; exploring their preference for different format of educational material and then in developing and evaluating the educational materials. The current study has highlighted some of the implications of conducting research with children; the need for methodologies which are appropriate for children and flexibility and openness in planning research activities. The importance of consulting and cooperating with gatekeepers i.e. teachers and the difficulties for schools especially secondary schools to participate in such research due to the condensed structure of the curriculum was also explored.

The difficulties in finding schools to participate has been described by other researchers (Williams et al., 2011; Kellet, 2005). Kellet (2005) also included children from primary schools, as the curriculum is more flexible. Another aspect that needs to be addressed when involving schools in research is for the school teachers to understand that the activities would be beneficial for their pupils (Kellet, 2005). In the current study, although most of the schools approached by the research team were primary schools, it was difficult to find a school to engage. An alternative approach would have been to involve children outside of the core school hours (Williams et al., 2011) or to approach out of school clubs and organisations could have been considered by the research team. Fortunately a school was successfully approached before this approach had to be taken.

In phase 2 of this research, the activities were planned with the support of the teachers. Their facilitation of the activities in conjunction with the research team allowed the activities in school to run smoothly. The children engaged well during the presentation session and during the classroom activities. No signs of stress were observed among the children and they appeared to enjoy the group based classroom activities while producing the posters. An element of enjoyment and engagement is important in ensuring positive experiences and increased motivation and better interaction have been reported in similar group activities (Kirby, 2004). The children who developed the posters reported that they enjoyed activities and perceived their participation to be useful.

Restrictions in terms of time and resources were also limitations encountered by the research team, therefore the activities were planned according to the time and resources available. Ideally, the presentation session and classroom activities would

have been done on different days, to give children time to better process the information they had learned. Although initially the Head of Science teacher suggested that the children might be able to carry out their own research about dental trauma before developing the posters in order to encourage independent learning, this could not be done due to the time factors. The outcomes of the posters might have been different if this approach had been followed.

The posters produced by the children included information about dental trauma but also general information unrelated to dental trauma and close monitoring and guidance by the research team during the poster making would have been useful to ensure the content was focused on the theme of dental trauma. However, this was limited by the personnel available and all of the information included by the children was deemed useful for general oral health education posters therefore this information was retained in the modified version of the posters used in the next phase of the research.

The children's experience of participation in the research (phase 2) was evaluated. However, due to time limitation, this could not be carried out in depth using methods like focus group or interviews. This would have allowed exploration of their experiences and identified the children's likes and dislikes about the activities and if anything could have been done to make their participation a more productive experience for them.

In phase 4 of this study, one poster was chosen by children in phase 3 and one poster chosen by the research team, were used to assess children's preferences. The result showed that the preference of the posters was different, depending on the age and the preference was also influenced mainly by the design of the poster and the information included in the posters. When developing educational material, such as posters for children, it is important to consider these elements to ensure child friendly materials. Information presented in images or text combined with images was more attractive to children, as compared to text alone. The children's existing knowledge about the subject of dental trauma may have influenced the learning outcomes listed by the children, however their baseline knowledge was not evaluated in this study. It would also have been useful to explore children's opinions in depth, to help health care professionals develop educational materials which are attractive and comprehensible for the children. The effectiveness of the posters in increasing

knowledge about dental trauma among children can be determined by also evaluating their knowledge prior to being exposed to the posters.

The ability of children to participate in research have been doubted in the past, as competency to participate in research was associated to age, however this idea has been challenged (Woodhead and Faulkner, 2000). Children's competence may be different, but not lesser than adults (Waksler, 1991; Selberg,1996). The current research was designed with different methodologies and children were involved in every phase of the research, highlighting the feasibility of conducting research with children aged 8-9 years in developing educational materials that are relevant to them. However, it is worth highlighting the inability to generalise the involvement and positive response from the children who participated in this phase of the research to pupils in the mainstream schools, as the involved school is an independent school located in an urban area in London. Such schools are generally represented by pupils from families of higher socio-economy status (SES). It has been suggested that family socio-economic status impacts the children's development of intelligence (Von Stumm & Plomin, 2015). It is possible that children from higher SES families have better opportunities for, and support in cognitive engagement and learning (Bradley & Corwyn, 2002). The school's flexibility in incorporating activities out of the planned curriculum gave the children the opportunity to be frequently exposed to external activities, and this factor could have contributed to the positive engagement of the children.

PHASE 8:

FUTURE RESEARCH

8 Future research

1) The effectiveness of the posters produced by the children should be evaluated, and this could be done by displaying the posters in schools or other public places. One method to carry out the evaluation would be to utilise the posters as intervention tools and assessing knowledge regarding dental trauma before and after the poster intervention.

2) To further evaluate the effectiveness of the material developed, comparison between existing educational materials about dental trauma and the newly developed posters could be undertaken. This could be in terms of preference for the different methods but also the impact on knowledge.

3) Utilisation of the posters as tools to educate the public about oral health dental trauma especially in children in public places (schools, sports club, dental clinics) could be evaluated.

4) To explore the positive and negative impacts of being involved in research for both the participating children and the school, in order to evaluate the advantages and disadvantages of the methodology used in this research.

5) It would also be very interesting to involve children in the development of other types of educational materials ie. leaflet, videos. Exploring other resources other than schools may be useful, in view of the difficulties experienced in accessing schools.

6) Including participants from younger and older age groups than the children involved in this study may also be interesting in the development of other dental educational materials.

CHAPTER 9:

CONCLUSION

9 Conclusion

This study showed that involving children in a school setting posed some challenges for recruitment, and ensuring that the research did not adversely impact on the school curriculum. Sufficient planning was required to allow schools the flexibility to engage with research activities.

Children of different age groups preferred different educational material about dental trauma. In this research, younger children (8-11 years) preferred posters, whilst older children (12-14 years) preferred videos.

An interactive presentation was useful to deliver information about dental trauma to children aged 8-9 years old. The children were able to reproduce the information they had learned to develop hand drawn posters about dental trauma. The activities were both enjoyable and useful for the children.

The posters produced by the children had different amounts of information about dental trauma, and the majority of posters also included information about prevention of caries. These posters may be useful as general oral health educational material for children in a wider setting.

When the posters were evaluated at the EDH, children of different age groups preferred different formats. Design features and information presented in the posters were the main reasons for children's preference between the two posters. General information about dental trauma was the information most commonly listed by children. Information that was presented in image format were preferred to information which given only in text format.

CHAPTER 10:

REFERENCES

10 References

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11 Appendices

Appendix 1

UCL RESEARCH ETHICS COMMITTEE
ACADEMIC SERVICES

12 June 2015

Dr Susan Parekh
Department of Paediatric Dentistry
Eastman Dental Institute
UCL

Dear Dr Parekh

Notification of Ethical Approval
Project ID: 7123/001: School children's participation in developing educational material about dental trauma

I am pleased to confirm in my capacity as Chair of the UCL Research Ethics Committee (REC) that your study has been approved by the REC for the duration of the project i.e. until September 2017..

Approval is subject to the following conditions:

1. You must seek Chair's approval for proposed amendments to the research for which this approval has been given. Ethical approval is specific to this project and must not be treated as applicable to research of a similar nature. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing the 'Amendment Approval Request Form':

2. It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. Both non-serious and serious adverse events must be reported.

   Reporting Non-Serious Adverse Events
   For non-serious adverse events you will need to inform Helen Dougal, Ethics Committee Administrator (ethics@ucl.ac.uk), within ten days of an adverse incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Chair or Vice-Chair of the Ethics Committee will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

   Reporting Serious Adverse Events
   The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator immediately the incident occurs. Where the adverse incident is unexpected and serious, the Chair or Vice-Chair will decide whether the study should be terminated pending the opinion of an independent expert. The adverse event will be considered at the next Committee meeting and a decision will be made on the need to change the information leaflet and/or study protocol.

On completion of the research you must submit a brief report (a maximum of two sides of A4) of your findings/concluding comments to the Committee, which includes in particular issues relating to the ethical implications of the research.

Appendix 2

Audit on children's preferred type of information material about dental trauma

Age:

Gender: Male / Female

Sometimes children fall over and knock their teeth. It is important that everyone knows what to do if this happens. This can help to save the damaged teeth. Please the box below for the method you think is best to give this sort of information (**PLEASE TICK ONLY ONE BOX**).

1. Leaflet

We can have these in hospitals, dental clinics, schools, gyms or sports club

☐

2. Poster

We can display posters in dental clinics, schools, gyms or sports club

☐

3. Video

Videos on sites like Youtube. Can be watched on TVs, computers, iPads or smart phones.

☐

4. **Other materials**

If you have any other ideas, please write them down

_____

_____

_____

_____

☐

Thank You

Publication Date: 14.12.15
Date last reviewed: 14.12.15

Appendix 3

School Children Participation in Developing Educational Material on Injuries to teeth

Parent Information sheet

UCL

1. Invitation

Your child is being invited to take part in this study involving children in research. Before you decide, it is important that you know why the research is being done and what they will be asked to do. Please read this leaflet carefully, contact the research team if there is anything that is not clear or if you want more information.

2.What is the aim of the study?

A third of school children will have injury to their teeth (dental trauma) by the time they leave school. Children can injure their teeth in accidents or while playing sports. It is really important for people to know what to do if a tooth is injured, to get the best treatment as soon as possible. We would like to involve children in designing posters about injuries to teeth.

3. Does my child have to take part?

The decision to take part is optional and is entirely up to you and your child. If you decide that your child can take part in this study, you will be asked to sign a consent form. If you change your mind, your child is free to withdraw from the project at anytime, without giving a reason.

4. What will my child need to do if he/she takes part?

This study will take place in your child's school. Your child will be involved in a group discussion in the classroom and also in a classroom activity to create a poster about injuries to teeth.

Appendix 3 (Page 2)

5.What are the possible disadvantages/risks of taking part?

We do not anticipate any risks in this study. We will talk to your child's class teacher to ensure they do not miss any important lessons.

6. What are the possible benefits?

This study will help us to provide information on injuries to teeth in more effective ways, and allow children to be involved in research relevant to them.

7.What will happen with the results?

We hope to publish the results of the study. All information obtained will be confidential and you child will not be identified in any way. Your child's work may be presented to other children to assess their opinion about the work.

Contact details
Dr Susan Parekh
Professor Susan Cunningham
Ms. Elavarasi Kuppusamy
Tel: 02034561022
Fax: 02034562329
Unit of Paediatric Dentistry
The Eastman Dental Institute
256 Gray's Inn Road, London WC1X 8LD
s.parekh@ucl.ac.uk

8. Will my child's participation in the study remain confidential?

Yes, all information collected from your child will remain strictly confidential. The safety and security of the data will be the responsibility of the principal investigator (Dr Susan Parekh).

9. Who has reviewed the study?

All research at UCL is assessed by an independent group called the Research Ethics Committee (REC) to protect your child's safety, wellbeing and dignity. This study had been reviewed and approved by UCL REC. If you would like to see a summary of the findings, you are welcome to contact us.

If you need a large print or a translated version of this document, please do not hesitate to contact us on (020)3456 1022. We will try our best to meet your needs.

If you wish to discuss this study with a member of the research team or an independent expert who is not part of the research team, please ask Dr Susan Parekh

Thank you for taking your time to read this leaflet.

Publication Date: 29/03/16
Date last reviewed: 29/03/16
Version: 2

Appendix 4

School Children Participation in Developing Educational Material on Dental Trauma

Participant Information sheet
(Primary school)

We are doing a project and would like you to help us. Please read this leaflet and you can discuss with your friends, teachers and mum and dad as well.

1. Why is this project being done?

Sometimes children fall over and injure their teeth. It is important that other people know what to do if that happens as the tooth can be treated in the best way. We want your help to tell other children what to do.

2. Do I have to take part?

No you don't have to take part, it is up to you. We hope you will take part and if you do, will give you a form to sign. If you say yes now and change your mind later, you can always tell your teacher, your mum or dad.

3. What do I have to do if I take part?

We will come to your school and talk to you and your classmates about this research project and then you will take part in some fun activities like drawing. We will talk to your teacher and make sure you do not miss any important lesson.

If you do not understand something or have any questions to ask us, you can always email us at s.parekh@ucl.ac.uk

Publication Date: 29/03/16
Date last reviewed: 29/03/16
Version: 2

4. Why is it good for me to take part?

You can learn how to be a scientist and help with this research. Other people also can learn about injuries to teeth by looking at your work.

5. What will happen to my work?

We may show your work to other children to see how much they can learn about teeth injuries by looking at your work.

6. Will anyone else know that I am taking part in this research?

Only your mum, dad, teachers and classmates will know that you have taken part in this

7. Did anyone else check the study is OK to do?

Before any research is allowed to happen, it has to be checked by a group of people called Research Ethics Committee. This research has been checked by the UCL Research Ethics Committee.

THANK YOU

Appendix 5

School class:
Participant Identification Number for this study:

Form version: 2
Date: 29/03/16
REC Ref No: 7123/001

CONSENT FORM FOR PARENTS / GUARDIANS FOR CHILD'S PARTICIPATION

Tittle of project: School children's participation in developing educational material on injuries to teeth

Name of Principal investigators: Ms Elavarasi Kuppusamy, Dr Susan Parekh, Professor Susan Cunningham.

Please tick box

1. I confirm that I have read and understood the information sheet (Version 2 dated 29/3/16) for the above research. ☐
2. I confirm that I have had sufficient time to consider whether or not I wish my child to be included in the research. ☐
3. I understand that my child's participation is voluntary and that he/she is free to withdraw at any time, without giving any reason. ☐
4. I consent for my child to participate in this research. ☐

Name of child

Name of Parents/Guardian | Date | Parents/ Guardian's signature

Dr Susan Parekh
Researcher (to be contacted if there are any problems)

Tel: 020-3456-1022
Email: s.parekh@ucl.ac.uk

Comments or concerns during the study
If you have any comments or concerns you may discuss these with the investigator. If you wish to go further and complain about any aspect of the way you have been approached or treated during the course of the study, you should write or get in touch with the Research team. Please quote the reference number at the top this consent form.

Appendix 6

School class:
Participant Identification number for this study:

Form version: 2
Date: 29/03/16
REC Ref No: 7123/001

ASSENT FORM FOR CHILD'S PARTICIPATION

Title of project: School children's participation in developing educational material on injuries to teeth

.

Name of Principal investigators: Ms Elavarasi Kuppusamy, Dr Susan Parekh, Professor Susan Cunningham.

.

Please read and then tick the boxes:

1. Have you read the information sheet about this research? ☐
2. Has someone explained this research to you? ☐
3. Do you understand what this research is about? ☐
4. Have you asked all the questions you want to? ☐
5. Have you had all of your questions answered in a way you understand? ☐
6. Do you understand that it's OK to stop taking part at any time? ☐
7. Are you happy to take part in this research? ☐

If you are not happy to tick any box, or you don't want to take part, DON'T write your name!

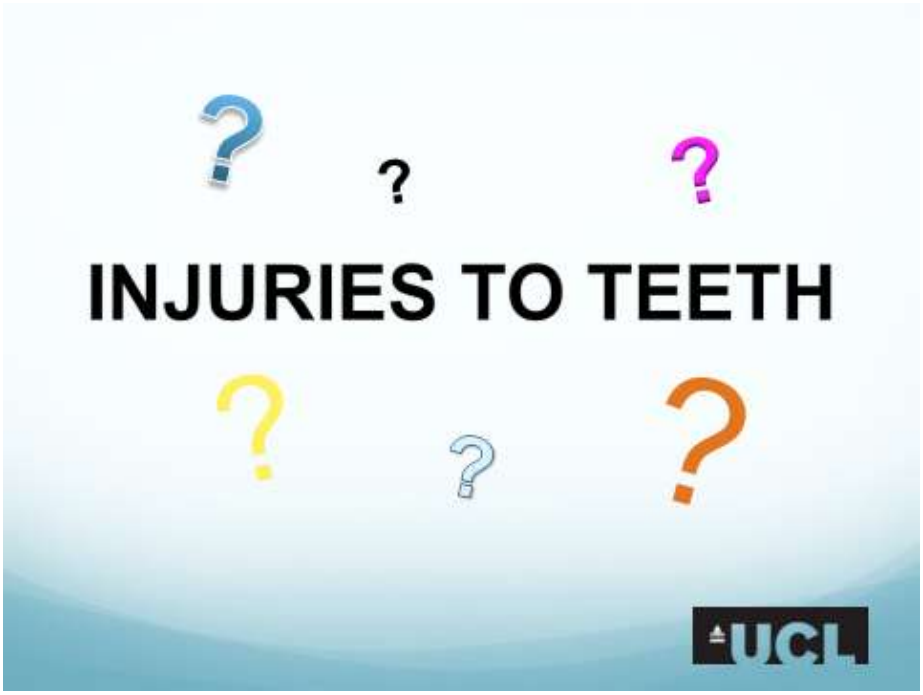
If you DO want to take part, please write your name and today's date below:

Your name:

Date:

Appendix 7


UCL
Hello
&
Welcome!
eastman DENTAL INSTITUTE


INJURIES TO TEETH
UCL

Why are teeth important?

Bite and chew food

Speak

Smile

UCL

How can teeth be injured?

Trips and falls

Trampoline

Sports

UCL

Which Sports?

Hockey 

Football 

Rugby 

Swimming 

Horse riding 

UCL

- 25% of children experience injury to their teeth 
- Boys more than girls
- Injured teeth → Soreness
  Problems eating
  Broken/loss of tooth

UCL

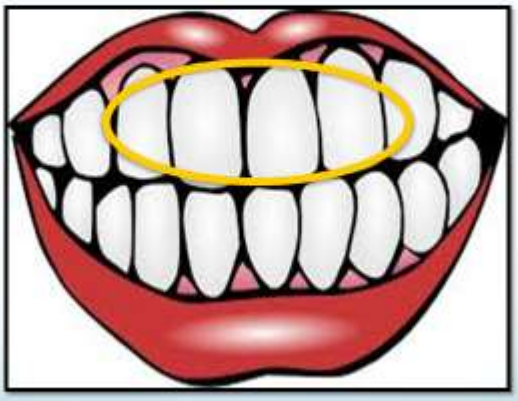
But….

If we do the right thing immediately…

Injured teeth can be saved!

UCL

Which teeth most commonly get injured?



UCL

Types of injuries

Broken or chipped

Loose or moved out of position

Knocked out of the mouth

UCL


KEEP
CALM
Let an adult know
UCL


At the dentist..
Before
After
UCL

If you can't find the broken part

Before

After

UCL

If the tooth is….

- Loose
- Moved out of its normal position

Go to the dentist immediately

UCL

KNOCKED OUT TOOTH

UCL

Adult tooth

Find the tooth and pick it up

Wash under running water if it's dirty

UCL

What should you do?

- Go to the dentist straight away?
- Find the tooth and put it back?
- Find the tooth and take it to the dentist?

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Hold the tooth by the crown

Put the tooth back in its hole

Go to the dentist immediately

UCL

What if you cannot put it back?

How do you keep the tooth?

UCL

Remember…

- Even if you think there is nothing wrong with your teeth after a knock to the mouth
- It's always good to check with the dentist!

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How to prevent injuries to teeth?

If you play sports that can cause injury to teeth

Football

Hockey

Rugby

UCL

Mouth guard

UCL

How can you help?

Create posters about:

- How to prevent injuries to teeth
- What to do if injuries to teeth happen

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- 2- 4 in a group
- 1 hour
- Papers, cards, coloured pen and pencils

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What happens next?

- Your friends from another class will choose the best poster in your class
- All of you will vote for the overall best poster during assembly

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Thank you for listening

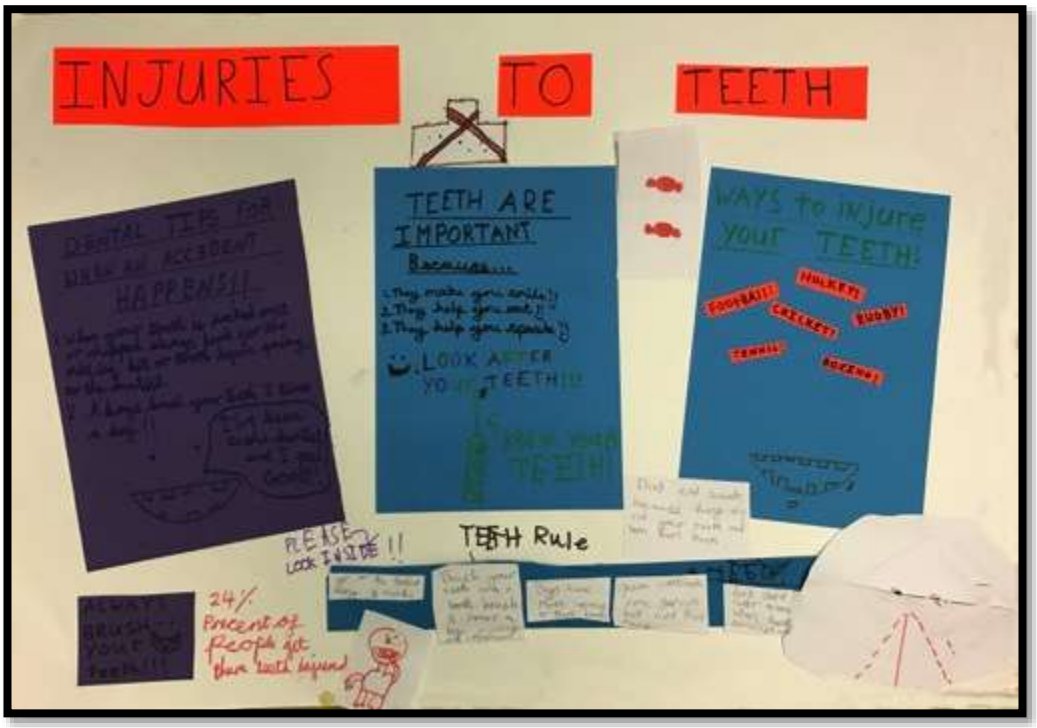
UCL

Appendix 8

Poster 1

Poster 2

Poster 3



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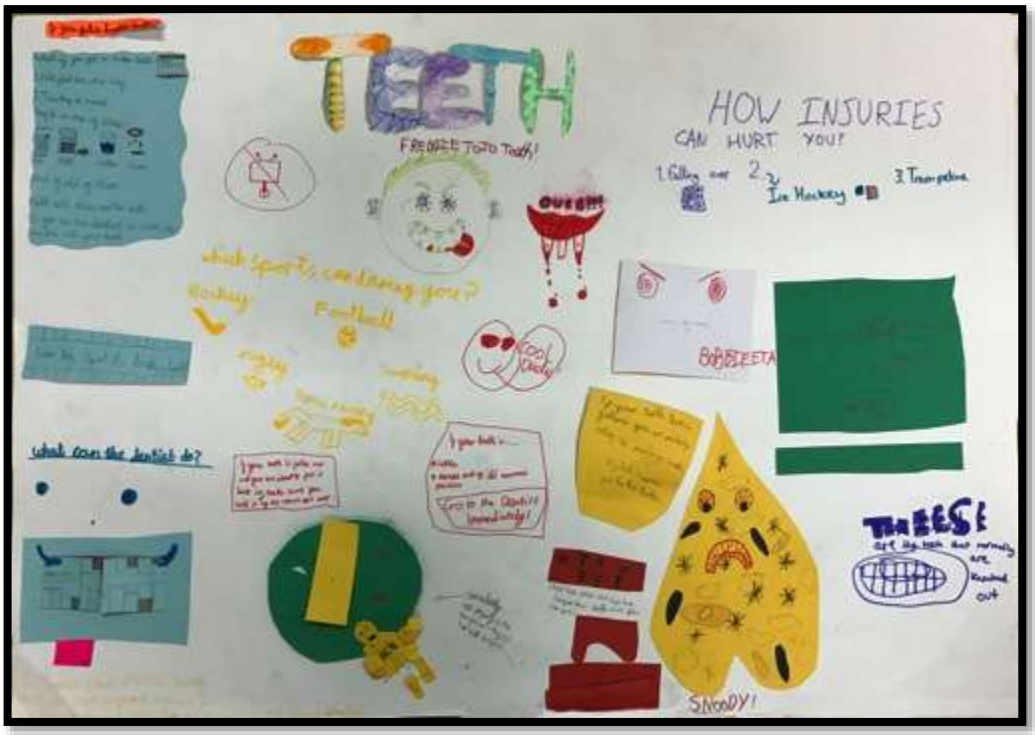

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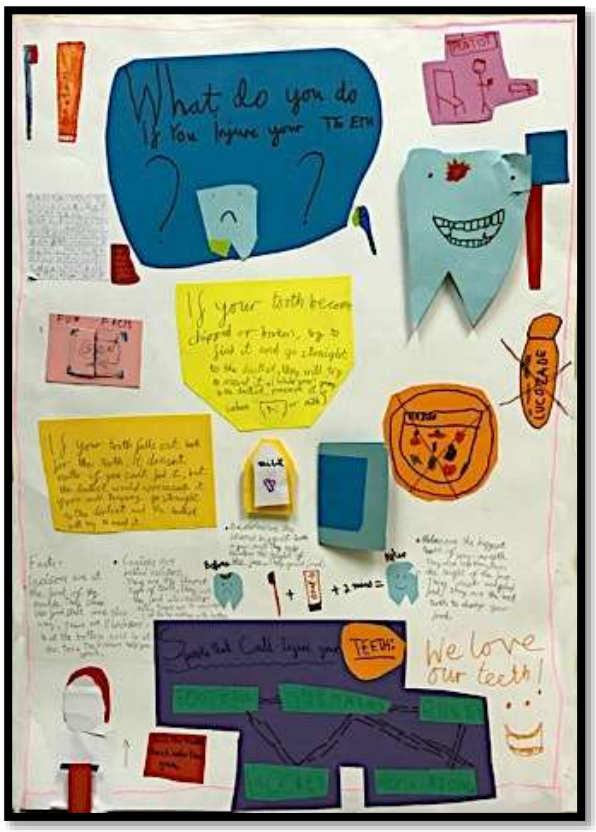

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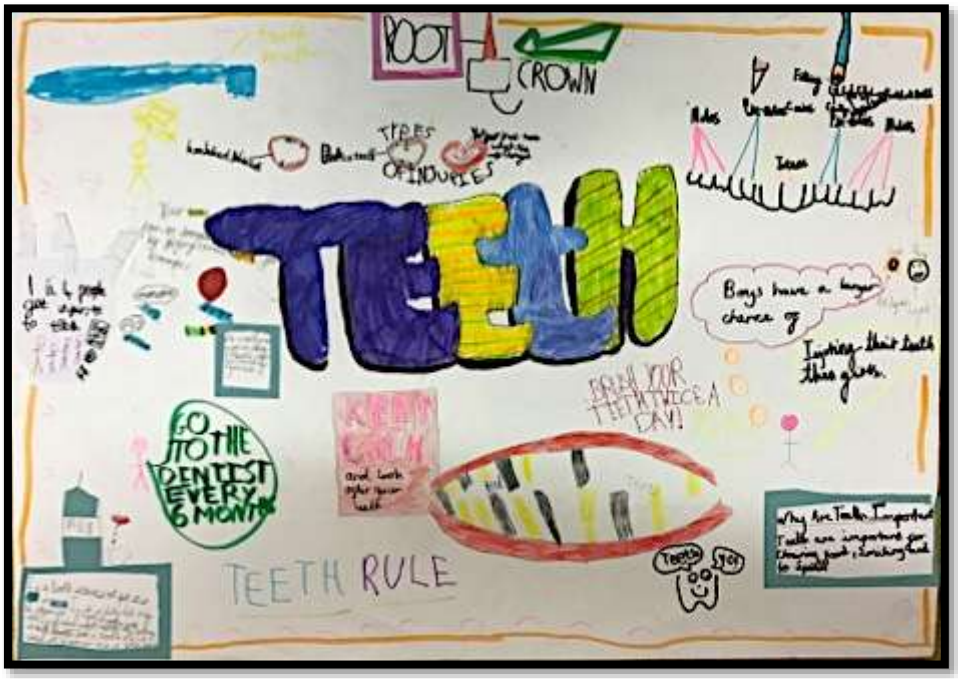

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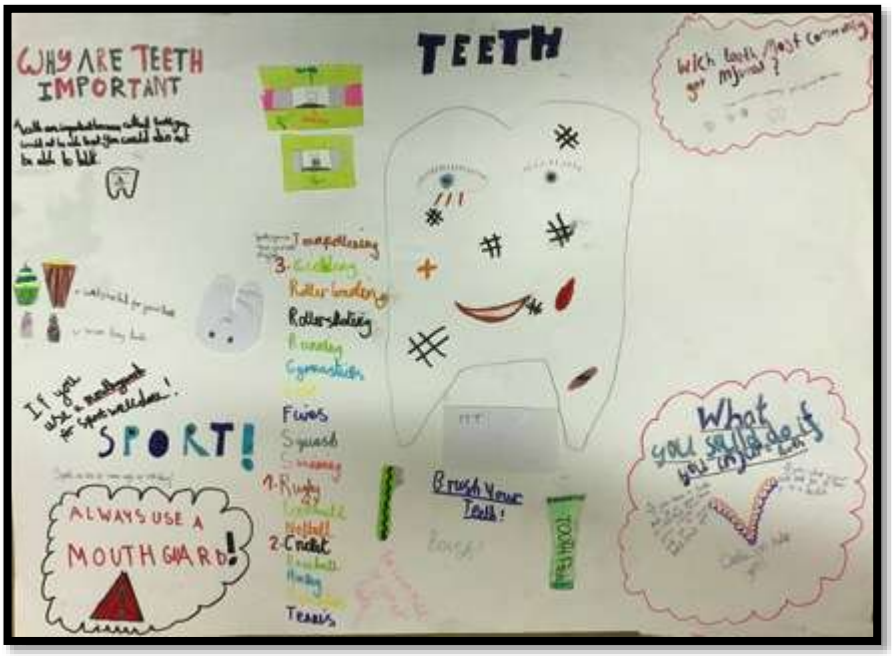
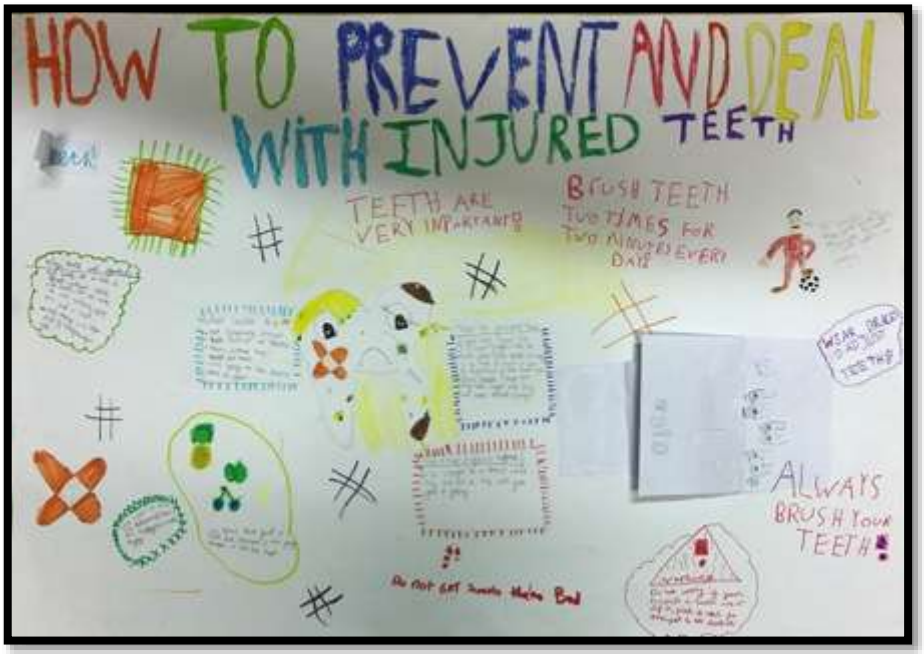


Poster 8



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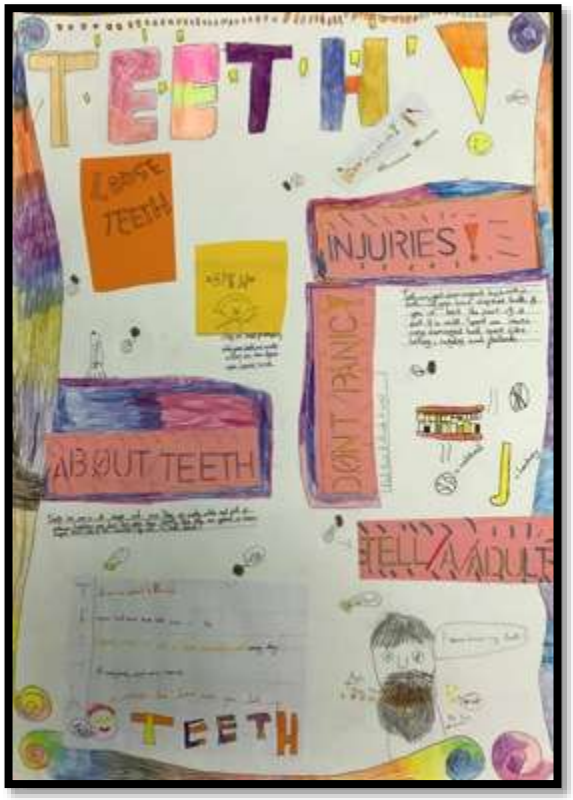
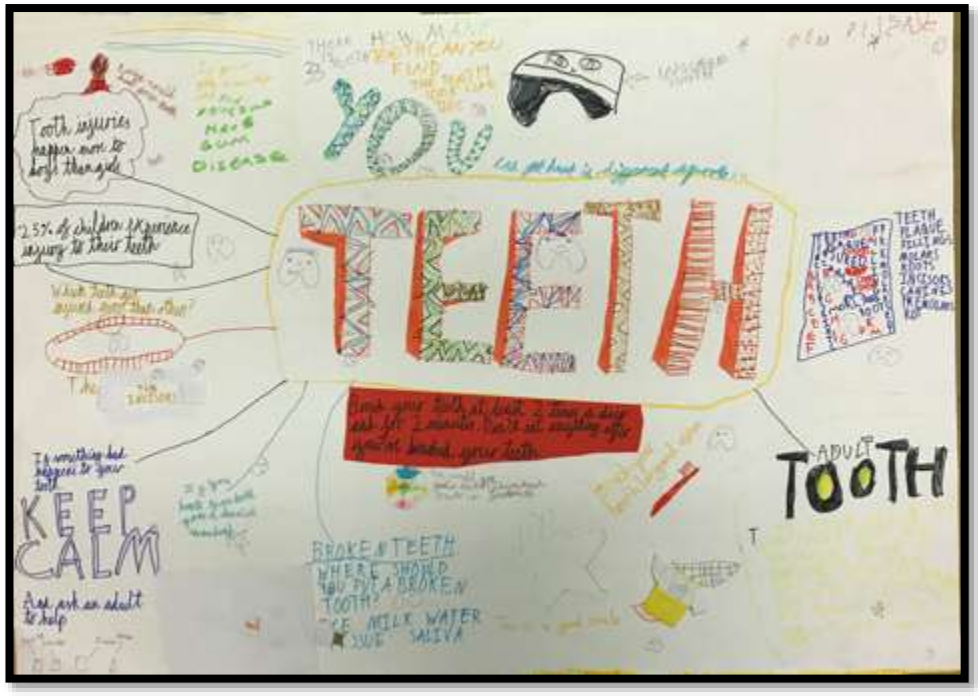
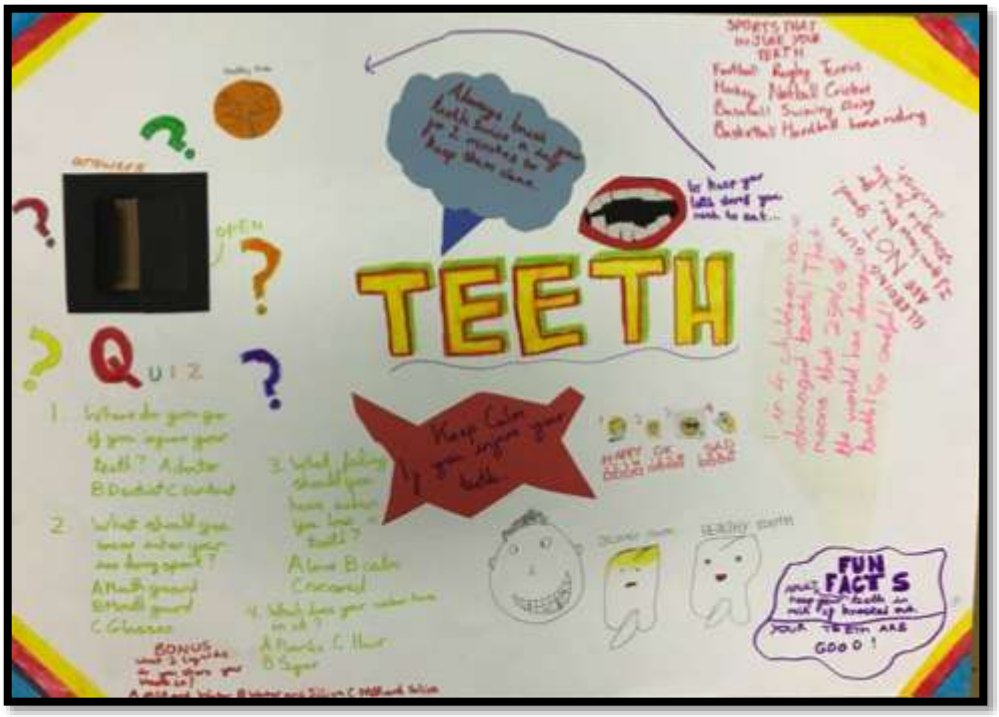


Poster 10

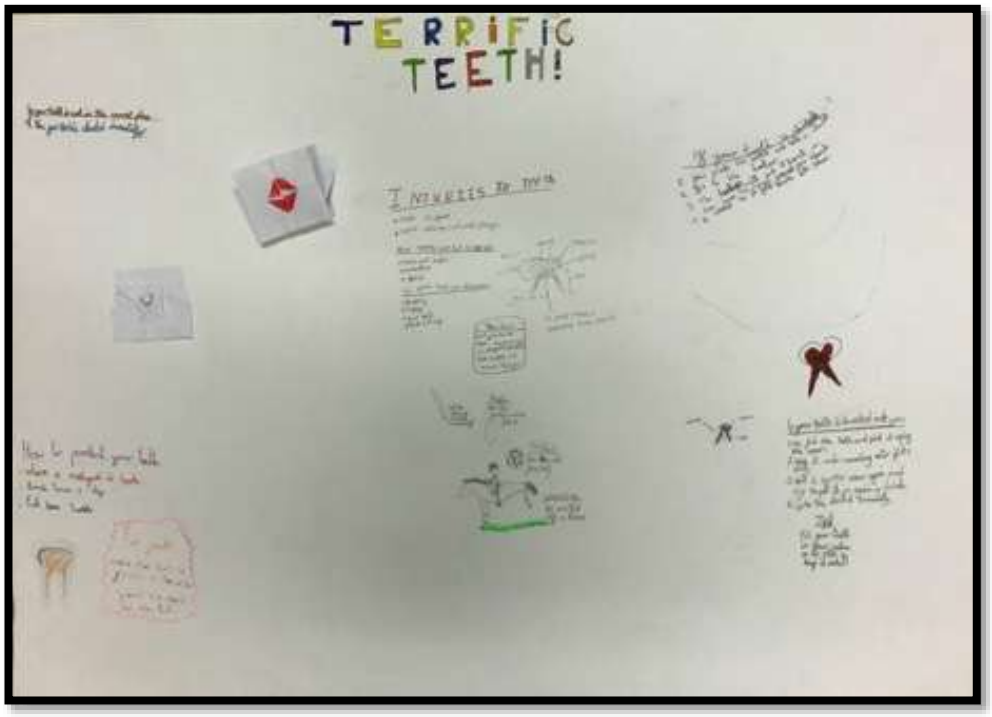


Poster 11



Poster 12

Poster 13



Poster 14

Poster 15

Poster 16

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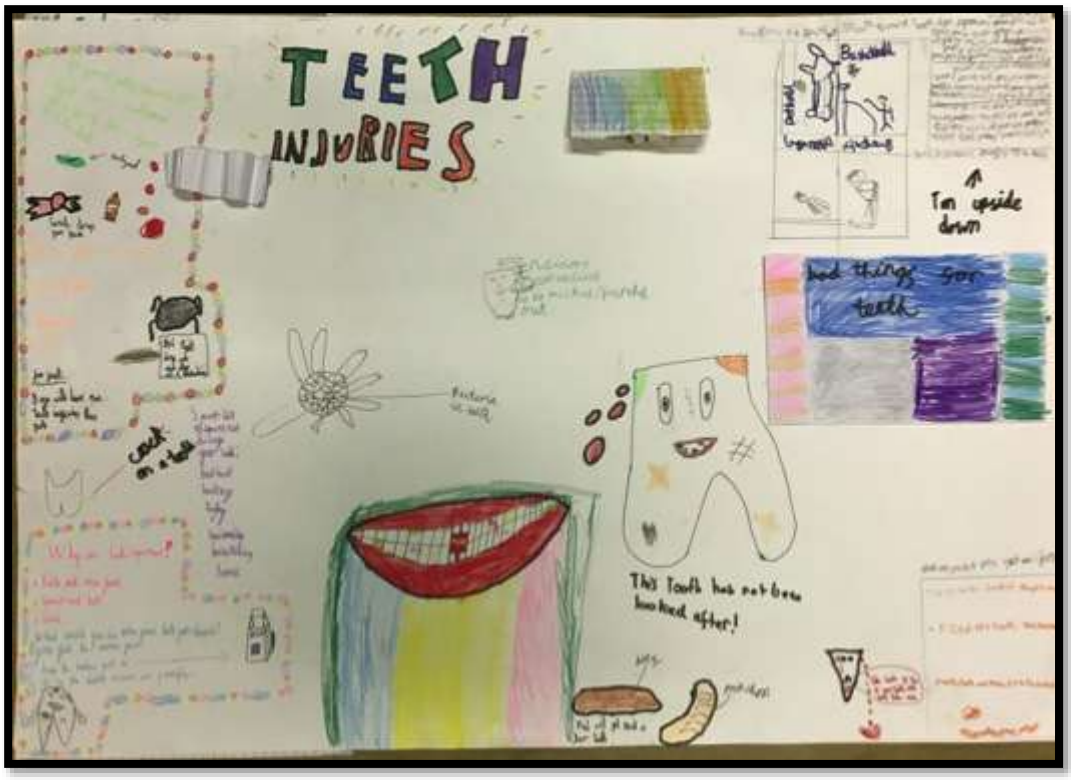
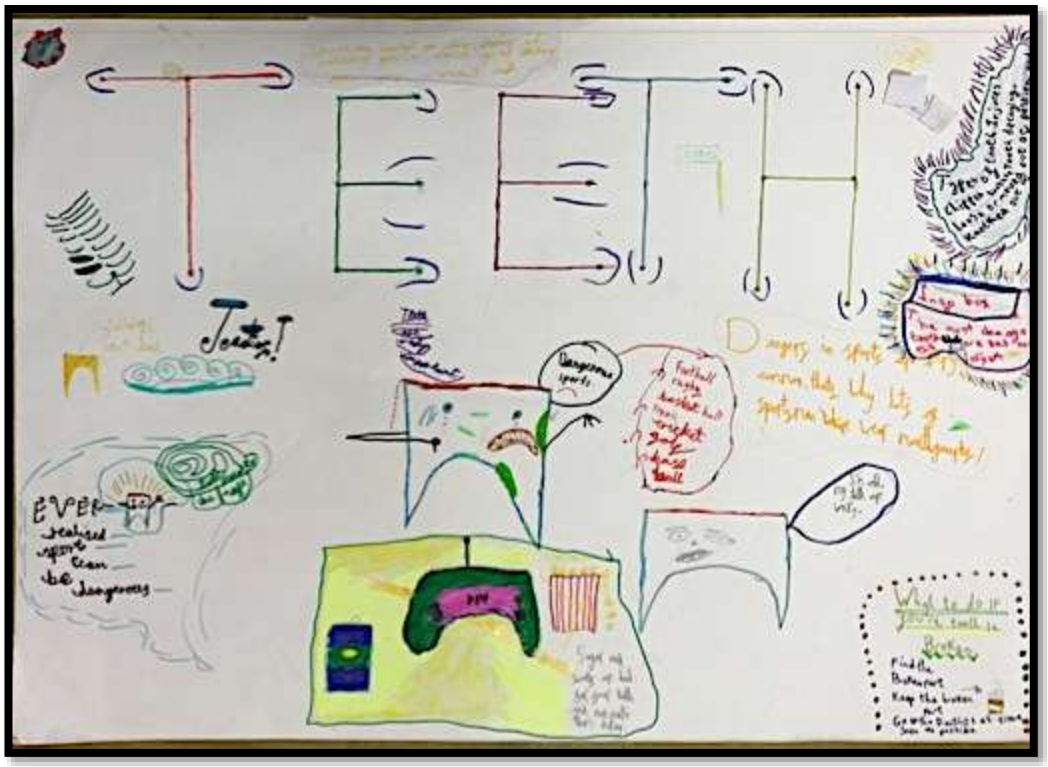
Poster 17

Poster 18



Poster 19

Poster 20



Poster 21

Appendix 9

Posters about Dental Trauma Developed by Children

Gender: Boy ☐ Girl ☐ Age: _____ years

These posters are about injuries to teeth and were done by children like you. We would like to know what you think about the posters.

1. Which one of the 2 posters do you like the most?

Poster 1 ☐ Poster 2 ☐

2. Why do you like this poster best?

_____

_____

_____

3. Please tell us **2** things you have learned from the posters.

a) _____

_____

_____

b) _____

_____

_____

Publication Date: 01/05/17
Date last reviewed: 01/05/17

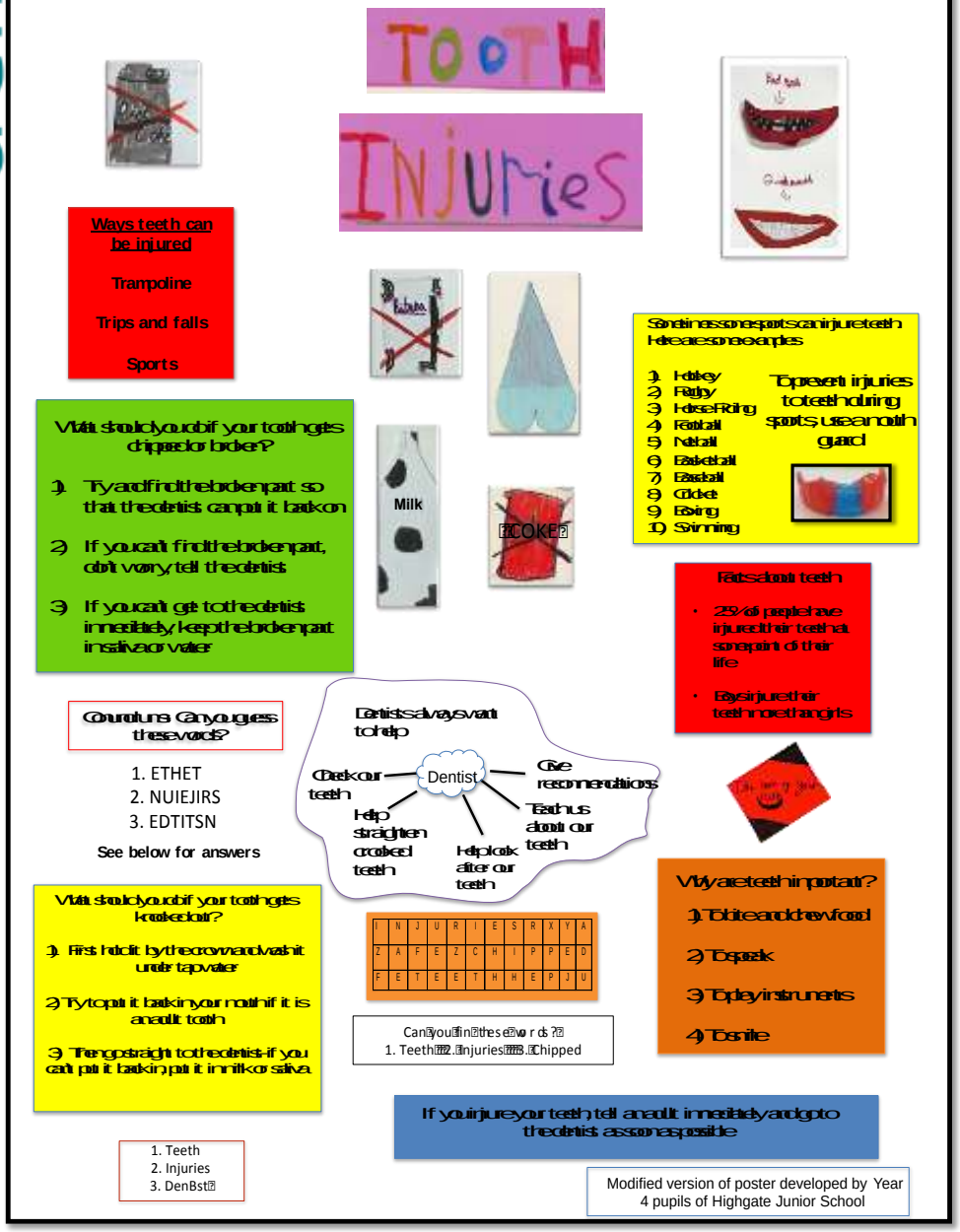
THANK YOU

Appendix 10

UCL eastman DENTAL INSTITUTE

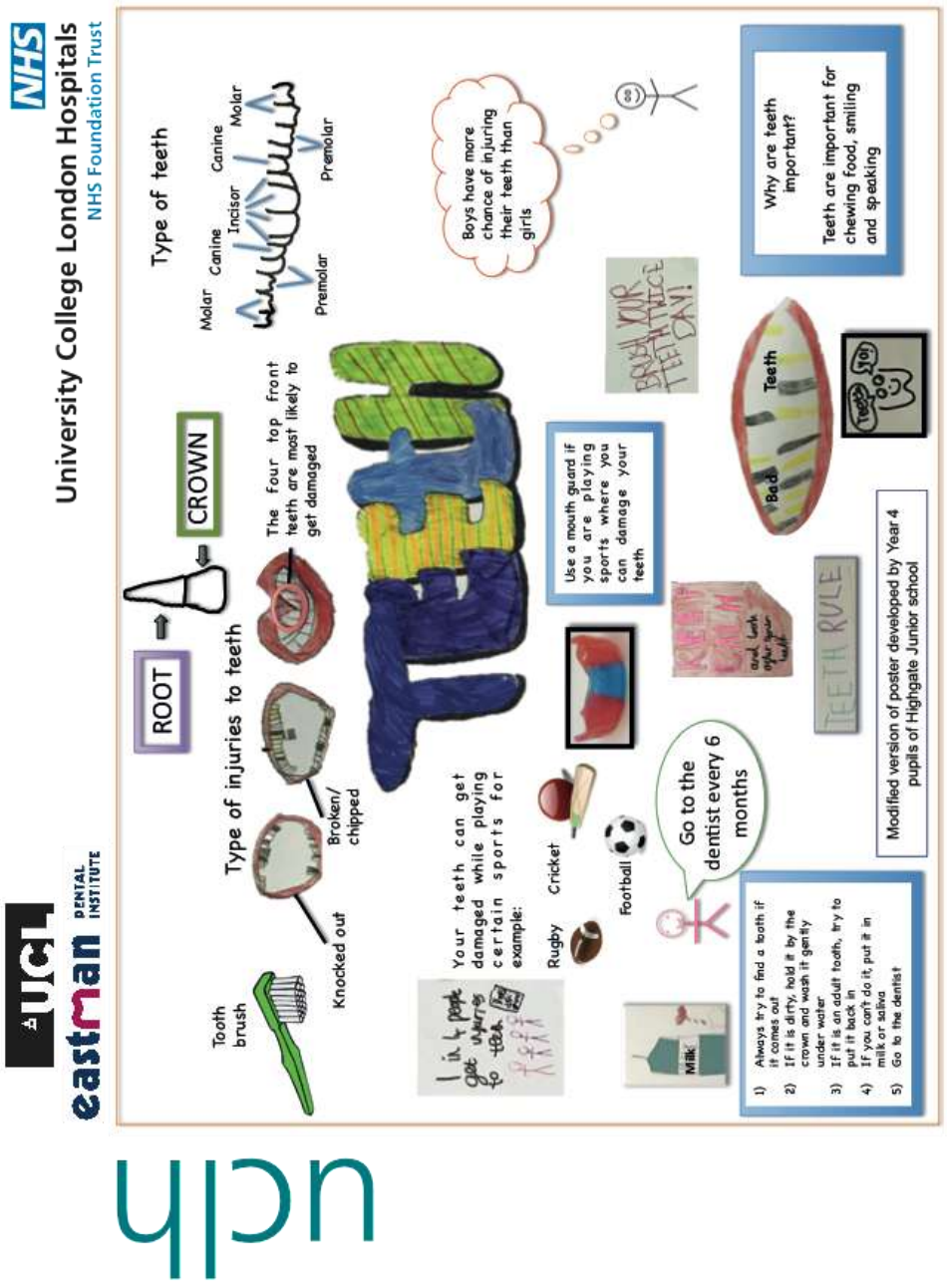
NHS University College London Hospitals NHS Foundation Trust

uclh



Modified version of poster developed by Year 4 pupils of Highgate Junior School

Appendix 11


UCL
eastman DENTAL INSTITUTE
NHS
University College London Hospitals
NHS Foundation Trust
Type of injuries to teeth
ROOT
CROWN
Type of teeth
Molar
Canine
Incisor
Canine
Molar
Premolar
Premolar
The four top front teeth are most likely to get damaged
Broken/ chipped
Knocked out
Tooth brush
Your teeth can get damaged while playing certain sports for example:
Rugby
Cricket
Football
Use a mouth guard if you are playing sports where you can damage your teeth
Boys have more chance of injuring their teeth than girls
Why are teeth important?
Teeth are important for chewing food, smiling and speaking
Bad
Teeth
Go to the dentist every 6 months
Milk
1) Always try to find a tooth if it comes out
2) If it is dirty, hold it by the crown and wash it gently under water
3) If it is an adult tooth, try to put it back in
4) If you can't do it, put it in milk or saliva
5) Go to the dentist
TEETH RULE
Modified version of poster developed by Year 4 pupils of Highgate Junior school