

EFFECTIVENESS OF ORAL HYGIENE  
INSTRUCTION TO PARENTS OF PRESCHOOL  
CEREBRAL PALSY CHILDREN

by

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## INTRODUCTION

Only limited success has been achieved in motivating and educating people to maintain or improve their behavior relating to personal health. One has only to reflect upon the persistence of cigarette smoking after the expressions of national concern over lung cancer to be cognizant of the difficulty of changing personal behavior patterns.

In the field of oral health the need has been recognized for a change in philosophical approach from an emphasis upon restorative and prosthetic dentistry to an emphasis upon preventive concepts, together with an organized educational effort to motivate the adult patient.<sup>1-4</sup>

Reorienting adults concerning their own health responsibilities is difficult enough, and asking parents to provide oral hygiene for the child who is too young or physically incapable of self-cleaning compounds the problem. However, it may be that oral hygiene for the young healthy child is best provided by the parent,<sup>5</sup> and this demands greater understanding of the reasoning involved in plaque control and motivation than many parents have. The parent to whom oral hygiene instruction is presented, may himself have an unhealthy dental situation. From a positive viewpoint the parent who is most receptive to education of oral health methods is one who has been motivated in a prior situation himself by a dentist or dental auxiliary.<sup>6</sup>



Several authors have dealt with the design of instructional methods for oral hygiene as correlated with different levels of improvement.<sup>5-11</sup>

In 1961 Starkey<sup>12</sup> recommended detailed teaching instruction to parents concerning proper posture and brush stroke for the preschool child. Lending support to this technique, Sangenes<sup>13</sup> in 1972 used trained hygienists with a manual brushing technique and concurred with Starkey on the effectiveness of the horizontal scrubbing motion as compared with a vertical motion in cleaning the primary teeth. However, the clinician might become confused by the reports of Hall and Conroy<sup>14</sup> and Owens<sup>15</sup> concerning the effectiveness of manual verses electric brushes in the preschool age group. Hall and Conroy claimed greater efficiency with the electric bursh but Owen said he could not support this finding despite a very detailed effort.

Dental problems in children with cerebral palsy have been identified by Album<sup>16</sup> as being similar to those of normal children. The dental caries rate may appear to be higher and the oral hygiene poorer; however, he gives no specific reasons as to why this is so.

Spastic societies and cerebral palsy clinics have lessened the daily frustrations of parents with cerebral palsy children by teaching techniques of dressing, feeding, toilet training, ambulating and communicating between parent and child.<sup>17</sup> These clinics conduct weekly classes for parents with similar problems, but it is unfortunate that dental education is often being provided without the support and help of pedodontists.



In 1970 Mathewson and Beaver<sup>18</sup> sent out 1,142 questionnaires, one-half of them to general practitioners of dentistry and the remainder to members of the American Academy of Pedodontics, to survey various aspects of dental treatment for handicapped patients. These findings revealed that of all handicapping conditions treated by pedodontists, cerebral palsy ranked at the top. Also, the results indicated that of the 91.86 per cent of the cerebral palsy children receiving care by a pedodontists, 85.5 per cent of these children were under four years old. Mathewson and Beaver<sup>18</sup> reported that McConnell's survey in 1967 showed that only 12 of the 54 schools of dentistry offered a short-term postgraduate course to train dentists for the management of handicapped patients.

Various clinicians have improvised techniques to deal with the handicapping situation that a cerebral palsy child may present.<sup>19-22</sup> The etiology of the carious process is related to the same factors in the normal as the cerebral palsy child.<sup>23,24</sup> However, the home environment is an entirely different situation with the latter.

There has been little discussion in the literature on how parents of cerebral palsy children should be taught to remove plaque from their children's mouths. Johnson and Albertson<sup>25</sup> emphasized education of the parent in restraining, mouth propping, staining and flossing, and nutritional supervision. However, they did not outline a program nor did they provide criteria for evaluating home instruction.

This investigator had the opportunity of examining a group of cerebral palsy children of preschool age at weekly intervals for two years. Oral hygiene was found to be extremely inadequate. Parental interest was excellent, but lack of knowledge at the early levels of the child's



training was leading to neglect and costly dental repair. Due to the frustrations parents have expressed in their attempts to brush an uncooperative subject, it was felt that establishing a step-by-step instructional method both to restrain the child and to provide oral hygiene in a daily routine might benefit the parents of these children.

In evaluating the effectiveness of these measures, a plaque index was used, together with the written responses to a questionnaire concerning educational objectives which had been outlined in the presentation to each parent who received the special instructions. These instructions to the test group of parents included involving both parents in mouth propping for access to all teeth, using restraints to prevent harm to either child or parent, disclosing the teeth to locate different areas to concentrate on cleaning, and applying a simple but effective horizontal scrub method of brushing. Results for this group of parents were compared with those for a control group of parents receiving no instruction and with those for another group who received instructions as if they were parents of normal children without physical or mental defects.

The purpose of this investigation was to determine whether the parents who received a more specialized instructional method would demonstrate improvement in oral hygiene for their children, as measured by a lower debris index score (indicating the acquisition of skills by the parents), and added knowledge of oral health care principles, as measured by scores on a written examination. It should be added that neither of these scores would necessarily reflect the development of new attitudes or habits.

REVIEW OF LITERATURE



The intimate relationship between dental plaque and both dental caries and periodontal disease has been documented by a number of investigators.<sup>26-29</sup> Katz<sup>23</sup> defines plaque as a collection of bacterial colonies adherent to the surface of teeth and gingival tissues. For the purpose of this study, however, it may be appropriate to use Listgarten's<sup>30</sup> operational definition of plaque as that deposit which forms over a clean tooth surface in the absence of adequate oral hygiene.

Hennon, Mulher, and Stooky<sup>31</sup> in 1969 surveyed 915 white children between the ages of 18 and 39 months and found 57.2 per cent of these children with one or more areas of decay at 39 months of age. Radio-graphs were used to detect posterior interproximal lesions. This survey was conducted on normal children. In a review of the literature Listgarten<sup>30</sup> in 1972 stated:

The most promising approach for the prevention of dental caries and periodontal disease lies with the inhibition of the growth of dental plaque. Because of the continuous formation of dental plaque, its control must depend to a large extent on the patient's daily oral hygiene. It is, therefore, important for the patient and/or his parents to understand the nature and location of plaque and its role in dental disease; and to realize that despite frequent visits to the dentist, the latter cannot single-handedly cope with plaque control and prevent disease. This responsibility must be assumed by the parent and his child, and they must be willing and able to undertake plaque removal on a regular basis. Although chemical and immunological means of controlling dental plaque are the subject of extensive studies, these methods are still in the experimental stage.

Listgarten<sup>30</sup> adds that current methods for control of dental plaque depends primarily on the following means:

1. Mechanical devices for plaque removal
2. Disclosing solutions
3. Diet control



In discussing devices for plaque removal, Suomi<sup>32</sup> after an exhaustive review of literature stated:

The manual toothbrush is the most popular device used for oral hygiene in this country. Despite the availability of many designs and bristle types, no type of toothbrush has been shown to be superior to the others with respect to its ability to remove plaque. In general, however, recommendations have tended to favor a small brush with soft nylon bristles.

Much research has been done with regard to the use of toothpaste as an aid in plaque removal. In 1972 John and Green<sup>2</sup> noted that it is the mechanical action of the brush or floss that removes the plaque rather than the toothpaste; the taste of the toothpaste may encourage brushing, but the paste will obscure disclosing dye and should be avoided when dye is being used.

Bibby<sup>33</sup> in 1966 stated that toothbrushing can reduce the quantity of cariogenic materials but that toothbrushing as usually practiced is an inefficient procedure, and really does not achieve its purpose of removing destructive agents from caries-susceptible areas.

In 1967, Bay, Kardel and Skougaard,<sup>34</sup> investigated toothbrush design and its effect on plaque removal. These investigators studied seven different brushes and concluded that a large nylon multitufted brush cleans best. They used the Quigly and Hein<sup>35,36</sup> method of measuring plaque on teeth.

The frequency of brushing has been investigated and related to the organization of plaque. Ariaudo, et al,<sup>37</sup> stated that little stainable plaque has been found within 24 hours after the teeth have been thoroughly cleaned. Also, he indicated that there is evidence that the longer the plaque remains undisturbed, the greater the prevalence and severity of



gingival inflammation. Confirming this view, it has been demonstrated in a human population study that thorough cleansing of the teeth once every 24 hours may be sufficient for maintaining gingival health.

Disclosing solutions have been recommended for identifying dental plaque. Arnim<sup>8</sup> extensively investigated chemical substances that would adhere to debris on the teeth and indicate its presence by staining. Skinner<sup>38</sup> in 1914 may have been the first to report that microbic plaques and small granules of calcific deposits are transparent, or so nearly the color of the teeth that they are frequently invisible to the eye. The sense of touch, after months of experience with a hand polisher or orangewood stick, will only imperfectly indicate whether or not a surface is clean, so that a disclosing solution offers the only means of proving whether all foreign substance has been removed from surfaces not covered by gingival tissue.

During 12 years of research Arnim<sup>8</sup> found that a tablet with the F. D. C. Red #3 (erythrosin) food dye was the most effective and compatible method of disclosing plaque. He stated:

The most important outcome of this study is the knowledge that disclosing agents are useful for determining accurately the cleanliness status of individual tooth surfaces at a specific time in any mouth. This information may be used by anyone who wants to know whether a given instrument or method of combination thereof will clean teeth thoroughly. It provides every dentist with an accurate scientific test that he can use in his own office for measuring the effect of any hygienic agent on the dental microcosms adhering to the teeth of his patients. In addition, the results obtained by testing are useful to the patient as aids for learning how to use the instruments and methods for cleaning teeth most effectively. Those who learn to clean thoroughly, and do so regularly, prevent dental disease and preserve oral health.



Flossing has been recommended by O'Leary<sup>39</sup> as a valuable adjunct in removing food and bacterial plaque from the permanent teeth. The merits of flossing have been reported by Johnson and Albertson<sup>25</sup> using handicapped children and by Ariaudo<sup>37</sup> using normal patients. However, based on case reports, Listgarten<sup>30</sup> expressed the opinion that attempts by young children to insert floss or toothpicks interdentally can damage the attached gingiva. Furthermore, because manual dexterity is required in using these aids, close parental supervision may be needed. Listgarten<sup>30</sup> added that it might be wise to delay interdental cleaning as an integral part of daily oral hygiene until the teen years, when the patient has developed more dexterity and is less likely to damage gingiva. Johnson and Albertson<sup>25</sup> suggested that the parent use a floss holder with handicapped children. They stress that this is a difficult procedure. The present author certainly recognizes the importance of flossing to clean the interproximal surfaces of the teeth; and would suggest a practical approach to the handicapped child which would consist, first, of motivating a conscientious parent to brush efficiently and then, only after excellent results have been achieved with brushing, to enter into flossing for the young child.

Loe<sup>37</sup> stated:

The onset of gingivitis seems to be more related to the age of the plaque than to its amount and thickness so initial gingival changes first appear after 2-3 days of plaque development. Thus a clinically healthy gingiva may be compatible with a complete removal of plaque once every second day. It is not known at what stage in development plaque is cariogenic but it is generally thought that prevention of caries requires short intervals between brushing. Because of this lack of precise knowledge, it is difficult to prescribe a scientifically founded program for the mechanical removal of plaque which considers the prevention of both diseases.



In 1971 Hall and Conroy<sup>14</sup> studied the effectiveness of automatic and hand brushes when each was used by preschool children and by their parents for brushing the child's teeth. With either method, the parents were better able to clean the children's teeth than the children were. In neither group were the parents and children instructed in brushing technique. A plaque index similar to that of Quigly and Hein was used and statistical analysis provided. The automatic brush was seen to be more effective than the hand brush when used either by the child or the parent.

In 1972 Owen<sup>15</sup> studied the effectiveness of the manual and electric toothbrush when used by preschool children. The age range was from 2.11 years to 6.02 years and the mean age was 4.02 years. Although Owen's findings failed to support those of Hall and Conroy, in which the electric toothbrush was significantly superior to the manual brush in removing plaque, Owen suggested that the novelty effect of the electric brush may have influenced the subjects to brush longer and/or more efficiently. He stated that for some children, an electric toothbrush may have real value, if only to motivate them to brush more often, although for most children an electric toothbrush and a manual toothbrush appear to be equally effective. In 1972 Suomi<sup>31</sup> stated that no one brush could be recommended as superior for all persons. The selection of a brush and the instructions for its use should be tailored to the individual.

Sangnes<sup>13</sup> selected 5-year-old children for her investigation of the effectiveness of vertical and horizontal brushing techniques in plaque removal. Trained hygienists did the brushing in an effort to rule out



differences in dexterity among the children. Her results indicate that in children of this age the horizontal scrub technique is more efficient than the roll technique in removing plaque from the buccal and lingual surfaces of the teeth.

Starkey<sup>12</sup> as early as 1961 identified a technique for the parents to use in brushing a child's teeth. He stated that parents receiving specific instructions in a detailed approach to brushing their children's teeth are more motivated to follow through with the recommendations given.

Although Clark, Cheraskin and Risegrdorf<sup>40</sup> would disregard the validity of many oral hygiene investigations, various attempts at improving oral health through education techniques have been reported.<sup>41-44,46-48</sup> Love<sup>45</sup> contended that evaluative procedures are necessary and should include pretesting, baseline determinations, and continued checking in order to reduce the gap between knowledge and practice.

Koch, Koch, and Gunilla<sup>46</sup> tried three methods of teaching oral health to 11-year-old patients: Lecture, audio visual and programmed instruction. All three resulted in a definite increase in learning by these students as exemplified by testing before and after instruction.

Podshadly and Schweikle<sup>44</sup> divided 8-10 year old students into three groups with three different types of instruction on brushing and found no statistical difference in the groups. Since the information was presented primarily by the lecture method, and the performance level was comparable to that of a control group, they suggested that dentistry evaluate its methods of presenting oral health motivation by lecture.



In 1966 Lindhe and Koch<sup>47</sup> investigated the effect of three years of daily supervised oral hygiene on the gingiva of children 12-14 years of age. They found that the progression of gingivitis with age in childhood can be inhibited by prolonged supervision of toothbrushing. A dental hygienist supervised the brushing.

Stolpe<sup>48</sup> presented a well-controlled study about dental health education. For pupils in the fourth, fifth and sixth grades, he instituted an intensive programmed course of dental health education consisting of pamphlets, films, discussions, classroom projects and the like. As a control he gave dental health education only via textbooks and one 45-minute lecture (typical of most health classes). Stolpe found that the level of knowledge could be significantly improved through dental health education but that attitudes about oral health and the practice of oral health change very little. The improvement in dental health education was quickly forgotten as evidenced by a post-post test.

Research appears to be lacking in the area of motivational appeals to parents and/or children to improve or maintain good oral hygiene. Evans<sup>3</sup> investigated the effects of (1) high fear arousal, (2) moderate fear arousal, (3) positive affect arousal, (4) elaborate recommendations only, and (5) brief recommendations only, directed at improving toothbrushing behavior. The results suggested that elaborate recommendations and positive affect arousal were most effective in changing actual behavior, but that high fear and recommendations only were the most effective in changing reported behavior. This provides provisional data supporting the view that actual behavior and attitudes do not necessarily coincide.



In this investigation, the findings of a 6 weeks post-communication regression underline the limitations of investigations involving only immediate post-communication measurements of the effects of persuasive appeals. They also strongly suggest that such research designs would be enhanced by schedules of repeated presentations or reinforcers.

Evans, Rozelle and Forbes<sup>49</sup> and Evans, et al<sup>50</sup> investigated a chemical indicator of toothbrushing behavior (disclosing tablet) as a method of developing a behavioral measure of attitude change and examined its utility for large scale field research efforts. Each of three groups of subjects formed from 68 junior and senior high school students was presented with a different form of communication with the context of the school's dental hygiene program. The communication appeals were (1) positive affect; (2) high fear; and (3) moderate fear. Besides disclosing tablets, the study used a plaque index, and slides of the teeth were taken for recording scores. The preliminary results of this investigation support the effectiveness and utility of this procedures in assessing behavioral change with a natural setting.

Evans<sup>3</sup> and Arnim<sup>8</sup> have suggested that the disclosing tablet may not only reveal plaque concentration at a given moment but may also be a reasonably reliable indicator of frequency of toothbrushing. Photographs of teeth stained with the disclosing tablet (if the individuals are not aware beforehand that such photographs are to be taken) might be a significantly more valid indicator of toothbrushing behavior than reported toothbrushing behavior.



Varying the method of presenting dental health education material to parents was reported by Starkey<sup>51</sup> in 1962 and again by Gillig<sup>52</sup> in 1969. Neither investigation revealed that audiovisual material significantly improved performance on written test scores over presentation by standard written instruction. Neither investigator allowed the parent to keep the information at home for learning at the parent's own rate.

#### Cerebral Palsy Child

Cerebral palsy has been defined by Denhoff and Robinault<sup>53</sup> as "one component of a group of childhood neurologic disorders which reflect cerebral dysfunction rather than damage per se and which may result from cerebral maldevelopment, infection, injury or anoxia before or during birth, or in the early years of life. Delayed maturation or even intense emotional stress may be causative."

Bowley and Garner<sup>17</sup> list four main types of cerebral palsy on the basis of physiology.

1. Spastic: Composing 75% of all C-P. Exhibiting rigidity of movement, inability to relax muscles.
2. Athetoid: Frequent involuntary movements with writhing movement of limbs, face, tongue and slurred speech. This group comprises 10% of this total.
3. Ataxia: Poor body balance, difficulties in hand and eye coordination and control.
4. Mixed: Nearly 10% show all of the above features.

The present investigation will use the topographic and physiologic classification and coding system used by the Nomenclature and Classification Committee of the American Academy for Cerebral Palsy.<sup>53</sup>

#### TOPOGRAPHIC

1. Monoplegia        -involves one limb.
2. Paraplegia        -involves legs only (spastic or rigid types usually).
3. Hemiplegia        -one side of the body is affected; usually spastic,  
                         occasionally athetoid.
4. Triplegia         -involves three extremities, more often both legs  
                         and one arm; usually spastic.
5. Quadriplegia     -involves all four extremities.
6. Diplegia          -paralysis affecting like parts on either side  
                         of the body, usually legs more than arms.
7. Double  
   Hemiplegia        -arms more involved than the legs.

The type of cerebral palsy that a child has tells us little about his handicap.<sup>17</sup> It is therefore important to know, in addition to the type and number of limbs affected, the degree to which motor control is impaired. Most clinicians would describe a child who can walk and talk and whose physical movements are just a little clumsy, as mildly physically handicapped. A child whose speech is indistinct, who has some difficulty controlling his hands, and who can walk, although unsteadily, is usually described as moderately physically handicapped. A severely handicapped child is one whose independence is very limited because of very limited control of his arms and legs.



Bowley and Garner<sup>17</sup> in 1972 expressed the opinion that parents of severely handicapped children have practical and psychological problems in the upbringing and care of their child. The arrival of such a child is usually a shock, and many mothers find it difficult to accept the facts, and to plan care and training constructively. Feelings of guilt are fairly common in such cases, though usually quite unfounded. Sometimes, though this is rare, the parents find it hard to love their disabled child fully and feel resentful and hostile toward the world and everyone who tries to help. However, a very close tie usually grows between the mother and child. In a few parents this tie becomes so close that they refuse to consider outside help, such as residential care, in cases where the child's physical and intellectual handicaps are so severe as to dominate the entire family life.

The mood of the parents may vary from pessimism and hopelessness on the one hand to over optimism and denial of reality on the other. It is a very difficult situation and professional workers are sometimes presumptuous in the counsel they give to the parents. For example, glib advice to "treat him as normal" is clearly out of the question in the case of a severely handicapped child. The reality of handicap is that there are some things the child can do within limitations and others he cannot do and never will do.



Henderson<sup>54</sup> stated that the poor oral hygiene condition of the Cerebral Palsy patient is due to one or more of the following:

1. difficulty in toothbrushing by himself.
2. inability of the patient to clean his own teeth with subsequent reliance on other individuals.
3. impossibility of use of a toothbrush in case of tremors and spasms.
4. retching and vomiting provoked by the insertion of brushes or other objects into the mouth.
5. reduced efficiency of the natural self-cleansing action by the tongue, cheeks, lips and saliva.

Oral hygiene cleanliness has been shown to be lower in the cerebral palsy child than in the normal child.<sup>55</sup>

Album<sup>16</sup> described various dental problems observed in children with cerebral palsy.

1. Cephalometric measurement revealed that the only deviations in facial dimensions were found to be mid-facial protrusiveness.
2. The cerebral palsy children had twice as much malocclusion as the control group of normal children.
3. The cerebral palsy children had an almost characteristic open-bite, along with crowded upper and lower anterior teeth.
4. The cerebral palsy children were found to have a smaller palate, especially in the breadth dimension. This, with an accompanying large tongue, may be the etiologic factor in open bite.



5. Gingival tissue was found to be comparable to normal unless Dilantin was used or oral hygiene was non-existent.
6. Using dental development standards, the teeth appeared to be calcifying normally and were slightly ahead of both chronological and skeletal age.
7. The dental caries rate appeared to be higher than for the normal child in a comparable age bracket.

Hori<sup>56</sup> evaluated the dietary habits of 30 cerebral palsy patients and found that their diets were predominately soft and lacking in calories, ascorbic acid, and calcium as compared to 30 normal children. Magnusson and Deval,<sup>57</sup> supporting current information concerning the etiology of caries and periodontal disease, have suggested that the higher incidence of gingivitis and caries might be due to the difficulty of maintaining satisfactory oral hygiene for cerebral palsy children.

Bush<sup>58</sup> stated that low carbohydrate diet, fluoride applications, thorough brushing and stimulation of the gingiva were all necessary in maintaining oral hygiene for the handicapped child. She noted that the parents of these children often have to brush the teeth for the child and suggested a position in back of the child, which is not only comfortable for both child and parent but also provides emotional security for the child.

There have been attempts to enable the cerebral palsy<sup>59</sup> child to clean his own teeth without parental help. In one investigation Holcomb<sup>60</sup> used a device called Masticlean and compared results with those from children using a toothbrush for debridement of the oral structures. The



difference between the scores of the plaque index for the children using the Masticlean and those using the toothbrush were not significant at either the first or second appointment. The Masticlean device is made of a synthetic rubber, with a semiflexible handle supporting a removable section of foamed sponge. The child chews on this device and the rationale of operation is a "mechanical scrubbing action combined with a hydraulic flushing effect created by the forces of mastication."

The electric toothbrush has gained support for those handicapped children who are able to some degree to manipulate an instrument.<sup>61-63</sup>

Doykos, Sweeney and Gloss<sup>61</sup> instructed children in the use of an electric brush and found that without supervision or parental help the electric brush may be of value as an aid to oral physio-therapy. Their study was not designed to answer the question as to which is better, electric or hand brushing, with the cerebral palsy child.

The largest percentage of handicapped patients who receive dental treatment do so in the offices of practitioners who limit their practices to children.<sup>18</sup> Resources for educating dentists in the treatment of handicapped patients, whether at the undergraduate level or through a continuing education program, still appear to be limited in scope. Johnson and Albertson<sup>25</sup> have stated:

Because home care is essential to an effective plaque control program, oral hygiene for handicapped children is dependent on the quality of care given by parent or guardians. Parents can be taught various techniques to enable them to care for their children's oral health more easily and completely.



## METHODS AND MATERIALS

Subjects for this investigation were 79 preschool children, ages 17 months to 70 months, with the major medical diagnosis of cerebral palsy, who participated in the IUPUI Medical Center Cerebral Palsy Clinic on an outpatient basis. None of the children had ever received dental care.

After being divided by sex and age (above and below 48 months) the children were randomly assigned to one of the three groups without regard to physical defect or parental preference (Table I).

Group I consisted of 25 children whose parents received instructions in maintaining oral hygiene as if the child were not afflicted with cerebral palsy. (Instruction to the parent for a normal functioning preschooler involved teaching the parent how to brush.) Specific instructions for this purpose were found in the literature and printed so that each parent would have a copy to take home. Applications of the instructions were demonstrated to the parent at the first session. Verbal instructions based on the printed handout (Appendix #4) were presented along with the demonstration. The presentation to the parent was always made by the investigator. Along with these instructions, the parent was given the introductory letter (Appendix #1).

Group II consisted of 28 children whose parents received instruction designed by the author to be specific to the child's problem. These instructions were derived from clinical treatment situations dealing with the cerebral palsy child and modified to suit the home atmosphere.



These instructions were detailed as to what to do and why (Appendix #5). To increase comprehension, a pictorial representation of the technique (Appendix #6) was included with the written copy that each parent took home. At the first session of the group a demonstration was presented to the parent (Appendix #5). These instructions were formulated to help the parent restrict the child's movement, gain access to the teeth, and provide comfort to both the child and parent in a secure position. They also gave the parent reinforcement by permitting visual observation that good results were being achieved. Many said that the frustration of prior attempts had put an end to their efforts. A side effect derived from this approach would be the satisfaction which the parents would feel in being able to accomplish this most important task together instead of individually, with the main responsibility being assumed by the mother.

Group III consisted of the control group, and the parents of these children received no instruction in home plaque removal. Each of these 26 children in this group was given an oral examination covering hard and soft tissues and this information was placed in a medical record (Appendix #8).

Any child with a dental infection capable of causing pain or severe abnormality before the study period ended, was automatically referred to care facilities and not included in this study.

All children and parents in the study were met by the author in a clinical setting. Each child was given a thorough clinical examination of hard and soft tissues without radiographs. All information was



placed in the child's medical record (Appendix #8). Each child's teeth were disclosed with a liquid disclosing solution<sup>a</sup> consisting of erythrosin F. D. C. #3. This placed directly on the tooth with the plastic bottle applicator or cotton swab and the child's mouth was flushed with water. The author decided whether certain teeth needed re-disclosing. With the aid of a dental assistant and a hygienist, the teeth were examined for plaque scoring. A mouth prop was used at all times to indicate to the parents that this was how we maintained access to the area. The author evaluated the debris score and dictated the values to the assistant for the buccal and lingual of each tooth. The debris index was the method of Quigly and Hein (Appendix #7). Only after each child had been scored was the child placed in a group. The investigator had no knowledge of the particular instruction each child was to receive as he scored.

While the child was being examined at the first session with the investigator, the parent was asked to complete the questionnaire (Appendix #3). This questionnaire, hereafter described as the Instrument, was an attempt to put a value on the parent's beginning level of dental knowledge. The author would have preferred a standardized instrument but since none was available, one was formulated by attempting to identify the minimal knowledge a parent would need to do a satisfactory job of brushing the child's teeth. To identify this minimal knowledge, a list of teaching objectives was written according to the principles recommended by Mager.<sup>64</sup> For each objective listed, an appropriate behavior was

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a. TRACE, The Lorvic Corporation, St. Louis, Mo., 63134, U.S.A.



desired. This behavior was to be demonstrated by a written response or selection of alternatives in a multiple choice format. The first instrument for measuring basic dental knowledge consisted of nine multiple choice questions with four alternatives, one short answer with four spaces, and two opinions. The test items in the instrument were constructed according to the table of specifications described by Schoer.<sup>65</sup>

To identify the level of difficulty of these items and improve interpretation for both stem and alternatives, a pilot project was conducted. The unrevised instrument (Appendix #2) was administered to several families of cerebral palsy children and verbal feedback was obtained from the parents. The instrument was then revised to improve validity (Appendix #3). At each of three ninety-day intervals, the instrument was administered to the parents as post-test measurements while the child's teeth were re-disclosed and scored. The author was unaware of the group to which the child belonged during the evaluation procedures.

After the parent or parents completed the examination, the answers were scored in the presence of the parent and the correct answer explained. In this way, any misconceptions were removed. On each data sheet a numerical score for the examination and a numerical score for plaque count were recorded. To arrive at a plaque index the Quigly-Hein scoring method was used, with the number 5 being used for plaque covering the entire tooth, 4 for plaque covering  $3/4$  of the tooth, 3 for plaque covering  $1/2$  of the tooth, 2 for plaque covering  $1/3$  of the tooth and 1 for only a cervical trace of plaque. If the tooth was clean, a zero

score was assigned. The total score was then divided by the number of teeth present. Both the labial and lingual surfaces were scored in this manner. The initial plaque and test scores were then compared with the scores obtained at the ninety-day intervals using statistical analysis.



## RESULTS

A plaque index was established for each child by collecting data on the Quigly-Hein form (Appendix #7). This was then organized by totaling the plaque-covered surfaces and then dividing by the number of teeth present to reach a plaque index for each child. The number of correct responses on the test of dental knowledge provided a second set of data. These two numbers for each child were then transferred to computer cards and entered into the computer at the Research Computing Center at IUPUI, Indianapolis, Indiana.

#### DENTAL KNOWLEDGE TEST RESULTS

The pretest scores for each group were evaluated by means of an analysis of variance (F test) and found not to be significant both for test scores and plaque scores.

It was apparent, after arranging the data into computerized form, that several families in each group did not return for the second and third recall visits. On the other hand, some families returned for a fourth visit after nine months. To standardize the statistical data only those returning for the first three month intervals were analyzed. This reduced our subjects to a total of 13 in Group I, 24 in Group II, and 17 in Group III.

This was felt to be a noteworthy finding and was analyzed (Table II). A significant difference was found between the number of parents returning in Group I versus Group II. The results between Groups I-III and II-III were found not to be significant (Table II). The scores



for each group from the dental examination were compared using repeated t tests. In Group I, where instruction was presented as if the child had no handicap, there was improvement from pre-test to post-test at a significant level, a t value of 2.1 at the .05 level of confidence for Group I (Tables III, IV).

In Group II, where detailed instruction centered around the handicapping situation was presented, the greatest improvement was observed from pre-test to post-test with a t value of 2.2, which is significant at the .001 level of confidence. This group also had the most returning parents of any group, with 24 subjects measured (Table IV).

In the Group III parents, where no instruction was presented but findings of the clinical examination were explained to parents, there was little improvement from pre-test to post-test, with a t value of 39, which was not significant at the .05 level of confidence (Table IV).

#### PLAQUE SCORING RESULTS

The scores for each group from the labial and lingual plaque indices were compared using repeated t tests. In Group I, where instruction was presented as if the child had no handicap, there was very little improvement from pre-instruction scores to the post-instruction scores, with a mean value of -1.02 (minus indicating a decrease in plaque which was not significant) (Tables V, VI).

In Group II, where instruction was oriented around the handicapping situation, there was very little improvement from pre-instruction scores to post-instruction scores with a mean value of -1.34 (minus indicating a decrease in plaque, which was not significant) (Tables V, VI).

In Group III, where there was no instruction but findings of the clinical examination was explained to the parents, there was very little improvement from pre to post periods with a mean reduction of plaque of -1.72, which was not significant (Tables V, VI).

In Group I there were twelve non-returning subjects with a mean plaque index of 7.80. In Group II there were four non-returning subjects with a mean plaque index of 5.99. In Group III there were nine non-returning subjects with a mean plaque index of 7.79. No attempt was made to analyze further by computer the test and plaque scores of patients who did not return for a second appointment (Appendix 9-14).



## TABLES

TABLE I

ANALYSIS OF SUBJECTS  
ACCORDING TO AGE AND SEX

	<u>SEX</u>	
	MALE	FEMALE
NUMBER	43	36

	<u>AGE</u>	
	UNDER 48 MONTHS	OVER 48 MONTHS
NUMBER	53	26

MEDICAL CLASSIFICATION OF HANDICAP

CLASSIFICATION	Spastic Hemiplegia	Spastic Quadraplegia
NUMBER	7	17
CLASSIFICATION	Spastic Diplegia	Athetoid
NUMBER	28	5
MIXED CLASSIFICATION	22	



TABLE II

ANALYSIS OF THE PARENTS RETURNING  
AND NOT RETURNING THROUGHOUT THE STUDY

<u>GROUPS</u>	<u>PARENTS RETURNING</u>	<u>PARENTS NOT RETURNING</u>
I	13	12
II	24	4
III	17	9

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Statistical Analysis - (Chi Square Test)

The proportion of parents returning to all the sessions was significantly different for the three groups ( $x^2 = 8.61$ , d.f. = 2) at the .002 level.

The differences between groups was as follows:

Groups I - II Significant ( $x^2 = 8.5$ , d. f. = 1), at the 0.005 level

Groups I - III Not significant ( $x^2 = 1.06$ , d. f. = 1), at the 0.3 level

Groups II - III Not significant ( $x^2 = 3.82$ , d. f. = 1), at the 0.05 level

TABLE III

INCREASE IN "DENTAL KNOWLEDGE" OF PARENTS  
IN THE THREE GROUPS AFTER 90 DAYS IN THE PROGRAM

GROUPS	MEAN KNOWLEDGE GAIN (Post-test-Pre-test Scores)	S. E. OF THE MEAN
I	1.54	0.58
II	2.16	0.43
III	0.12	0.29

TABLE IV

REPEATED t-TEST COMPARISON OF THE  
THREE GROUPS ON DENTAL KNOWLEDGE  
AFTER 90 DAYS IN PROGRAM

GROUPS	DEGREES FREEDOM	t VALUE	% DIFFERENCE	P
I - II	35	0.862	-40.9	N. S.
I - III	28	2.17	92.33	0.001
II - III	39	3.88	94.56	0.05



TABLE V

MEAN DIFFERENCE IN CHILD'S DENTAL PLAQUE BY GROUPS  
AFTER PARENTS UTILIZED INSTRUCTION METHOD FOR 90 DAYS

GROUP	MEAN POST-TEST-PRE-TEST minus indicates decrease	S. E. OF MEAN
1	-1.02	.44
2	-1.34	.36
3	-1.72	.43

TABLE VI

STATISTICAL ANALYSIS OF PLAQUE DATA

GROUPS	DEGREES FREEDOM	t VALUE	% DIFFERENCES	P
1 - 2	35	.56	-31.3	N. S.
1 - 3	28	1.15	-68.6	N. S.
2 - 3	39	.69	-28.4	N. S.

The differences between groups were not significant

## DISCUSSION



Two different methods for maintaining home oral hygiene procedures were presented to two groups of parents of preschool children with cerebral palsy between the ages of 17 and 70 months. An initial score was obtained from the mother to establish her previous dental knowledge. Plaque indices for the children in this study were recorded at three-month intervals to determine if instructional methods were effective. A three-month interval was selected for its private practice practicality. In a control group no oral hygiene instruction was offered to the mother.

The basis for one method of plaque removal was access and restraint provided by both parents with emphasis on the individual needs of the handicap. The basis for a second method was cooperation of the child and participation by only one parent.

The data gathered by means of the Quigly and Hein plaque index indicated no significant changes in Groups I and II. Group III was not significantly different. It appears that exposure to the dentist had more motivational appeal than a specific educational level and immediate needs might be more appropriate.

The data gathered by means of this investigator's dental knowledge questionnaire indicated that Group I and II improvement was significant at the .05 level. In some parents the investigator could immediately see the improvement in dental knowledge and skill in brushing because their basic intellectual level appeared higher. In other individuals a confusion existed as to our intention. However, according to data,



no significant improvement in the plaque index on a long term basis occurred. Data from the second and third recall visits did not differ substantially.

For an objective assessment of the techniques being investigated, oral health care motivation would need to be high in all subjects. The environment would have to be the same. This investigator is keenly aware of the daily frustrations of the parents of cerebral palsy children. In some families the priority assigned to dental care would be lower - than in others, depending on many unmeasurable factors.

In the plaque part of the investigation, the oral examination was conducted in the afternoon, at a time when many children had probably not had their teeth cleaned since the previous evening and probably had just had lunch. Perhaps scoring the children early in the morning before eating, or after the evening brushing, would have produced different results. (A better control over subjects could deliver less variables.)

The attention span of the parents may have high negative correlation with the number of different special clinics visited by the child that particular day and with the child's anxiety behavior. Perhaps giving instruction to the parent in a private office and then examining the child separately would have directed the parents' attention more effectively.

The time interval chosen was appropriate in that many clinicians employ a 3-month recall period for handicapped children or those with a high caries rate. However, parents who were highly enthusiastic about the approach in Group II did not appear that way after three months



(perhaps due to the discipline needed). The test scores and plaque scores do not reflect the improvement that might have occurred in the first week or two after exposure to instruction. This suggests that more frequent intervals would benefit motivation through clarification and repetition.

The sample was small but representative of a cross-sectional population of cerebral palsy individuals. The sexes were evenly distributed with respect to age. The original plan of gathering longitudinal data was not possible because of the percentage of parents not returning for the second and third visit. These parents travelled from all areas of Indiana and distance was a key factor in the number of failed appointments.

One of the strong areas of the study is the plaque score. A very thorough index was used, and careful staining procedure to ensure disclosing every tooth. Assistance was used so that reading of scores was as unhindered as possible. The investigator was careful not to identify a child by group until after scoring.

Although the results of this study will not support a more disciplined approach to teaching oral hygiene procedures to the parents of cerebral palsy children, this investigator feels that the technique is more effective when and if the parental need is present for a more effective approach to a task they feel responsible for an inadequate in performing.

The literature is replete with references to situations in which a procedure may be effective but getting the public to practice the procedure in a truly effective manner is not possible.



Behavioral modification would take constant reinforcement in the home environment and a clean tooth is far from the reward many parents need. Even though these parents could and would respond correctly to a specific set of learning objectives, they would not practice what they knew. Appropriate performance does not necessarily follow appropriate learning.

Parents who could and would follow instructions were at that period of time looking for a better method and profited greatly.

The last question reflects some of the problems these parents face. Some representative replies are included.

To the question:

1. What are some of the problem areas you have encountered in cleaning your child's teeth?

For example:

A. Lack of Instruction.

- ☐ I've never had any instruction
- ☐ I don't really know how to brush his teeth without him choking.
- ☐ I'm unsure of my ability to clean them.
- ☐ My child just chews on the brush.
- ☐ She doesn't know how because of her handicap with her hands.
- ☐ I need instruction.
- ☐ Afraid my knowledge is limited.
- ☐ I have trouble getting into the back of her mouth.



\_\_\_ No one has ever shown me how.

\_\_\_ She isn't old enough to do it on her own.

2. What are some of the problem areas you have encountered in cleaning your child's teeth?

For example:

B. Proper Time.

\_\_\_ I'm always in too much of a hurry.

\_\_\_ It's hard to make time.

\_\_\_ It's difficult at times to find the time to teach her the proper ways of brushing and taking the time to be sure she does it. I believe it is very important and hope to do better.

\_\_\_ She never wants to be still when I want her to; she is always on the go.

\_\_\_ I just don't take the time somehow; it is difficult to brush someone else's teeth right.

C. Keeping the Mouth Open.

\_\_\_ He likes to bite.

\_\_\_ He closes his mouth when I try to brush the teeth.

\_\_\_ He wants to bite the brush.

\_\_\_ She gags when you try to open her mouth.

\_\_\_ Don't really know how to brush his teeth without him choking.

\_\_\_ I have an awful time getting into the mouth.

\_\_\_ It is hard to keep his mouth open long enough to manage brushing the teeth, so I take two tries to get them clean.

- \_\_\_ Gagging from toothpaste.
- \_\_\_ Very hard to hold still.
- \_\_\_ He closes his mouth when I try to brush them and he'd rather chew on the brush.

D. Child Moving - Explain.

- \_\_\_ She cries and won't be still; it's hard for one person to hold her.
- \_\_\_ I'd like to know how to keep his mouth open.
- \_\_\_ It's difficult to help him brush without jabbing him with the toothbrush.
- \_\_\_ My child has a clamping down reaction to the brush.
- \_\_\_ I had trouble getting into the back of her mouth.
- \_\_\_ He is hard to hold still and gets very mad.
- \_\_\_ She turns her head so often.
- \_\_\_ She bites all things in her mouth.
- \_\_\_ She is a natural 'live wire' and getting her to sit still for anything is a problem.
- \_\_\_ She doesn't like for me to brush her teeth so she won't open her mouth.
- \_\_\_ Wants to talk or complain during brushing.
- \_\_\_ Moves around constantly and won't keep the mouth open; doesn't want the toothpaste.
- \_\_\_ Moves hands and head.
- \_\_\_ She doesn't like her mouth messed with; moves around a lot and moves her head.



\_\_\_ He is very wiggly, but without head control it is much harder.

\_\_\_ He won't let me help him brush his teeth.

\_\_\_ She fights with my hands and gets mad and I can't reach them (teeth) as well as I should.

\_\_\_ Wiggles constantly and cries.

\_\_\_ Spastic and hard to control.

## SUMMARY AND CONCLUSIONS



Seventy-nine cerebral palsy children between the ages of 17 and 70 months were evaluated in the clinic of the James Whitcomb Riley Hospital for Children. The deposits of plaque on the teeth of the children in this study were disclosed and scored numerically.

Initially each parent of each child completed a series of written multiple choice questions designed to measure their knowledge of children's dental health. Three different groups of parents received either 1) oral hygiene instruction as recommended<sup>12</sup> (Starkey method); 2) very detailed instruction concerning the stabilizing the child by both parents, keeping the mouth open and revealing all areas of the teeth as outlined by the author; and 3) no particular oral hygiene instruction. Each child of the three groups received a thorough clinical examination and plaque score evaluation at the first evaluation.

The study was designed to provide recall procedures at three month intervals for a period of nine months and repetition of the identical instructional method initially chosen for the respective study groups. However, the sample dwindled to 54 after approximately 11 months due to failure of parents to make the second or third recall, which constituted six months of follow-up. The reasons for recall interruption were usually travel, change of condition or apathy toward the dental situation compared to medical condition.

The 54 subjects evaluated for initial scores, three-month interval and post instruction scores consisted of 13 children in Group I, receiving oral hygiene instruction as per normal child; Group II, receiving



specialized instruction per investigator, 24 children and Group III receiving no instruction and serving as controls yet receiving examination and exposure to operator, 17 children. Comparisons were made between groups for both plaque improvement in the child and learning improvement by the mother.

Parents in both Group I and II improved their scores from pre-test to post-test in the knowledge area as compared to the Control Group where no teaching was attempted. There was no significant improvement in their plaque-removing ability. Statistically, though, all three groups showed only slight plaque reduction.

The following statements summarize the findings of this investigation.

1. According to this experiment, parent instruction resulted in increased knowledge but had no value as far as actual reduction of plaque (which was the terminal objective).
2. Cognitive knowledge was not reflected in better behavior.
3. A study should be designed with large numbers of children and divided evenly according to
  1. Degree of mobility of each limb
  2. Social, economic and education characteristics of the family.

In the meantime, my only conclusion is that specialized instruction is not better than conventional instruction in reducing plaque. (Both scores improved by 1.0 plaque unit.)

In fact, no instruction at all resulted in equal, if not slightly better, reduction in plaque score.



## APPENDICES

Appendix #1

INTRODUCTION TO PARENTS OF CEREBRAL PALSY CHILDREN

Dental caries and gum infections are caused primarily by dental plaque. Dental plaque is a collection of bacteria which organizes on tooth structure and forms acids which can dissolve the surface of a tooth. In order to reduce dental disease, this plaque must be removed so that it will not form acids. Brushing is the most effective method of plaque removal.

Unfortunately, plaque is not readily visible to the human eye. By using a food coloring solution to turn plaque red, we can more easily remove it. This food coloring comes in a small plastic bottle and should be placed in the mouth before brushing. A few drops are placed on the tip of the tongue or top of the teeth before brushing is started. If the child swallows it, it causes no harm whatsoever.

This does not mean that fluoride in the water and fluoride tooth-pastes are not beneficial, but they are secondary to plaque removal.

R. Ditto, D.D.S.  
Cerebral Palsy Fellow



Appendix #2

Unrevised Dental Examination Designed  
To Measure Parents' Knowledge of  
Basic Dental Care for Their Child

DENTAL QUESTIONNAIRE

Circle the response that most correctly answers the question.

1. Many parents visit the dentist only for relief of pain. What is the most important thing your dentist can do for your child?
  1. Fill your child's teeth if he gets cavities.
  2. Relieve the pain when your child has a toothache.
  3. Provide the parent with information to reduce decay at home.
  4. Make sure your child will get all his adult teeth.
2. What is the best approach to oral health care for your child?
  1. Visits to the dentist twice a year.
  2. Restricting his diet as much as possible to nonsweet foods.
  3. Fluoride in his toothpaste.
  4. Home plaque removal by parents.
3. Are all teeth important - both baby teeth and adult teeth?
  1. Yes, early loss of a baby tooth can reduce the space a permanent tooth needs.
  2. Perhaps baby teeth are not as important as the adult teeth.
  3. Only the front baby teeth are important, because the back teeth don't show.
  4. Baby teeth come out anyway; why does it matter when they come out.

4. How has your child's teeth been kept clean?
  1. My child cleans his own teeth.
  2. My child cleans his teeth and so do I sometimes.
  3. I clean my child's teeth every day.
  4. No one cleans my child's teeth; it is too difficult.
5. Is a child under the age of 7 years capable of cleaning his own teeth?
  1. No, that is why he should see the dentist.
  2. No, parents brush the teeth better before this age.
  3. Yes, if he doesn't have a handicap.
  4. Yes, if he is a good child and knows he should brush.
6. What is the best way to brush your child's baby teeth?
  1. Brush them up and down, the way they grow.
  2. Scrub them back and forth on all sides.
  3. Vibrate the brush all over the teeth.
  4. Brush back and forth and up and down.
7. What causes decay and gum disease in your child?
  1. Soft teeth inherited from parents and grandparents.
  2. Collection of bacteria (called plaque) which forms acid.
  3. Candy, cokes, and chewing gum.
  4. Falling down and injuring the teeth while a baby.
8. Brushing is only one way of reducing the effects of bacteria and plaque. List others which are effective.
  - 1.
  - 2.



3.

4.

9. It takes bacteria 24 hours to form plaque; by brushing thoroughly once a day you are:

1. Keeping food off the teeth 24 hours a day.

2. Disrupting the bacteria so that acid is not formed.

3. Only limiting bacterial action since 3 brushings a day are required.

4. Doing the best you can since the task is difficult.

10. Unfortunately bacteria are invisible when on the teeth and gums.

How do you know when you have them all off?

1. The teeth feel clean and the breath is fresh.

2. The red coloring that sticks to the bacteria has been cleaned from all areas of the teeth.

3. You have brushed faithfully at least once a day.

4. The teeth are white and the gums very pink.

11. Do you feel that it is too much responsibility to clean your child's teeth?

Explain.

12. Do you feel that these instructions will make it easier for you as parents to carry out this responsibility in your home?

Explain.

Appendix #3

Revised Dental Examination Used in the  
Study Designed to Measure Parents' Knowledge and  
Basic Dental Care for Their Child

DENTAL QUESTIONNAIRE

Circle the response that most correctly answers the question.

1. Many parents visit the dentist only for relief of pain. What is the most appropriate age for your child to see the dentist?
  - a. An age when he will understand and not be afraid.
  - b. The age when you first notice small cavities in the teeth.
  - \*c. Around two years of age when all the baby teeth have erupted.
  - d. Around six years of age when his adult teeth begin to erupt into the mouth.
2. What is the best approach to oral health care for your child?
  - a. Visits to the dentist twice a year.
  - b. Restricting his diet as much as possible to nonsweet foods.
  - c. Fluoride in his toothpaste.
  - \*d. Home plaque removal by parents.
3. What is the relationship between baby teeth and adult teeth?
  - \*a. Early loss of a baby tooth can reduce the space a permanent tooth needs.
  - b. Baby teeth must be healthy for adult teeth to be healthy.
  - c. Nature allows for the baby tooth to fall out of the mouth at the proper time.
  - d. It may not be necessary to restore baby teeth, but adult teeth should be restored.

Note: \*Correct Response



4. How have your child's teeth been kept clean?
  - a. My child cleans his own teeth.
  - b. My child cleans his teeth and so do I sometimes.
  - \*c. I clean my child's teeth every day.
  - d. No one cleans my child's teeth; it is too difficult.
5. Is a child under the age of 7 years capable of cleaning his own teeth.
  - a. No, because he lacks instruction in brushing.
  - \*b. No, parents brush the teeth better before this age.
  - c. Yes, if he doesn't have a handicap.
  - d. Yes, if he is a good child and knows he should brush.
6. What is the best way to brush your child's baby teeth.
  - a. Brush them up and down, the way they grow.
  - \*b. Scrub them back and forth on all sides.
  - c. Vibrate the brush all over the teeth.
  - d. Brush back and forth and up and down.
7. What causes decay and gum disease in your child?
  - a. Soft teeth inherited from parents and grandparents.
  - \*b. Collection of bacteria (called plaque) which forms acid.
  - c. Candy, cokes and chewing gum.
  - d. Infections and other injuroies in early childhood.

Note: \*Correct Response

8. Brushing is only one way to reduce the effects of bacteria and plaque. List others which are effective.
- a. Fluoride in H<sub>2</sub>O.
  - b. Diet control.
  - c. Dental Flossing.
  - d. Restorative dentistry.
9. It takes bacteria 24 hours to form plaque; by brushing thoroughly once a day you are:
- a. Keeping food from collecting on the teeth and gums.
  - b. Disrupting the bacteria so that acid is not formed.
  - c. Only limiting bacterial action since 3 brushings a day are required.
  - d. Applying your own fluoride so that cavities do not develop.
10. Unfortunately, bacteria are invisible when on the teeth and gums. How do you know you have them all off?
- a. If you brush for 5 minutes you are insured of removing all bacteria.
  - \*b. The red coloring that sticks to the bacteria has been cleaned from all areas of the teeth.
  - c. Your experience of thoroughly brushing tells you.
  - d. The teeth are white and the gums very pink.
11. How do you compare the problem of getting into the mouth and holding your child still with the responsibility of cleaning your child's teeth?

Note: \*Correct Response



12. What are some of the problem areas you have encountered in cleaning your child's teeth? Example:

- a. Lack of instruction - Explain
- b. Proper time - Explain
- c. Proper place - Explain
- d. Keeping mouth open - Explain
- e. Child moving - Explain

Appendix #4

DENTAL CARE INSTRUCTIONS  
PROVIDED TO PARENTS OF GROUP I

Dental research indicates that parents brush their children's teeth much better than the children do. The brushing technique of children under age 7 has been brief and haphazard. We will ask you, the parents, to be responsible for brushing your child's teeth thoroughly once a day, preferably at bedtime. Parents brush their children's teeth more efficiently than the child; parents who have been given instructions brush more efficiently than those who have not been given instructions.

1. If you brush thoroughly once a day you will remove the bacteria and plaque (collection of bacteria and their acid products) before they harm the teeth and gums.
2. Place the red disclosing solution in the mouth before brushing the teeth. This solution causes all plaque to become red; then brush all the red color off the teeth in the following manner.
3. Parent stands behind child and tilts child's head back with the brush in one hand and the child's head cradled in the other.
4. Parent brushes all surfaces of the teeth, using the fingers to retract the cheek and lip muscles. As the maxillary (upper) teeth are brushed, the child's head is tipped back so the parent can see into the mouth.
5. Do not discourage your child from brushing his own teeth but remember that you are responsible for brushing once a day. The child may brush any time he cares to.



6. By brushing in this manner once a day, you are fulfilling for your child one of the most important health services. Not only will you be improving the oral health of your child but you will be decreasing his future dental expense.

Appendix #5

DENTAL CARE INSTRUCTIONS  
PROVIDED TO PARENTS OF GROUP II

Instructions for Cerebral Palsy child home dental care by parents.

1. Dental research indicates that parents brush children's teeth significantly better than the children do. Some children with cerebral palsy may never be able to brush for themselves.
2. We will ask you, the parent, to be responsible for brushing your child's teeth thoroughly once a day, preferably at bedtime.
3. Parents brush their children's teeth more effectively than the children do; parents who have been given instructions brush more effectively than those who have not been given instructions.
4. If you brush thoroughly once a day you will remove the bacteria and plaque (collection of bacteria and their acid products) before they harm the teeth and gums.
5. Cleaning your child's mouth will not be a frustrating and depressing task, if you parents become proficient in techniques of stabilizing the child so that you can easily get at the teeth and gums.
6. Seat the child on your lap facing you with the child's legs around your waist. One parent with the child in his or her lap faces the other parent and lays the child backwards onto the lap of the other parent so that the two of you are very close together and have control over the child's movements.
7. We will have three instruments for your use at this time.
  - a. A small soft toothbrush.
  - b. A mouth prop either of wood and tape or metal.
  - c. A food coloring solution to make the plaque on the teeth red.



8. One parent has a toothbrush and the plaque-disclosing solution; the other parent has a mouth prop.
9. No toothpaste is used! The mouth prop is placed on one side of the mouth as far back as possible. The parent with the legs around his waist holds the legs and arms stationary as the other parent cradles the child's head between his legs. The mouth prop is held with one hand, and the red solution is applied with the other.
10. The parent holding the head begins the brushing, taking care that the mouth prop is securely in position to prevent the child from closing on the parent's hand or breaking the brush thereby causing injury to the child or parent. A back and forth scrub type of brushing motion is used. The cheek side is brushed first, then the top of the teeth, and last the tongue side. The upper and lower teeth on one side are brushed at the same time. The teeth are brushed until all the red stain is gone. The child may swallow any time as the red material is nothing but food coloring.
11. When one side of the mouth is free of plaque, the mouth prop is moved to the other side and placed as far back on that side as possible. The red solution is then applied and this side is cleaned in the same manner.
12. To clean your child's teeth of all the bacteria will mean brushing until all the food coloring has been removed.
13. With this specialized technique, we feel that you will save your child many future dental problems and maintain a healthy mouth and a healthier child.

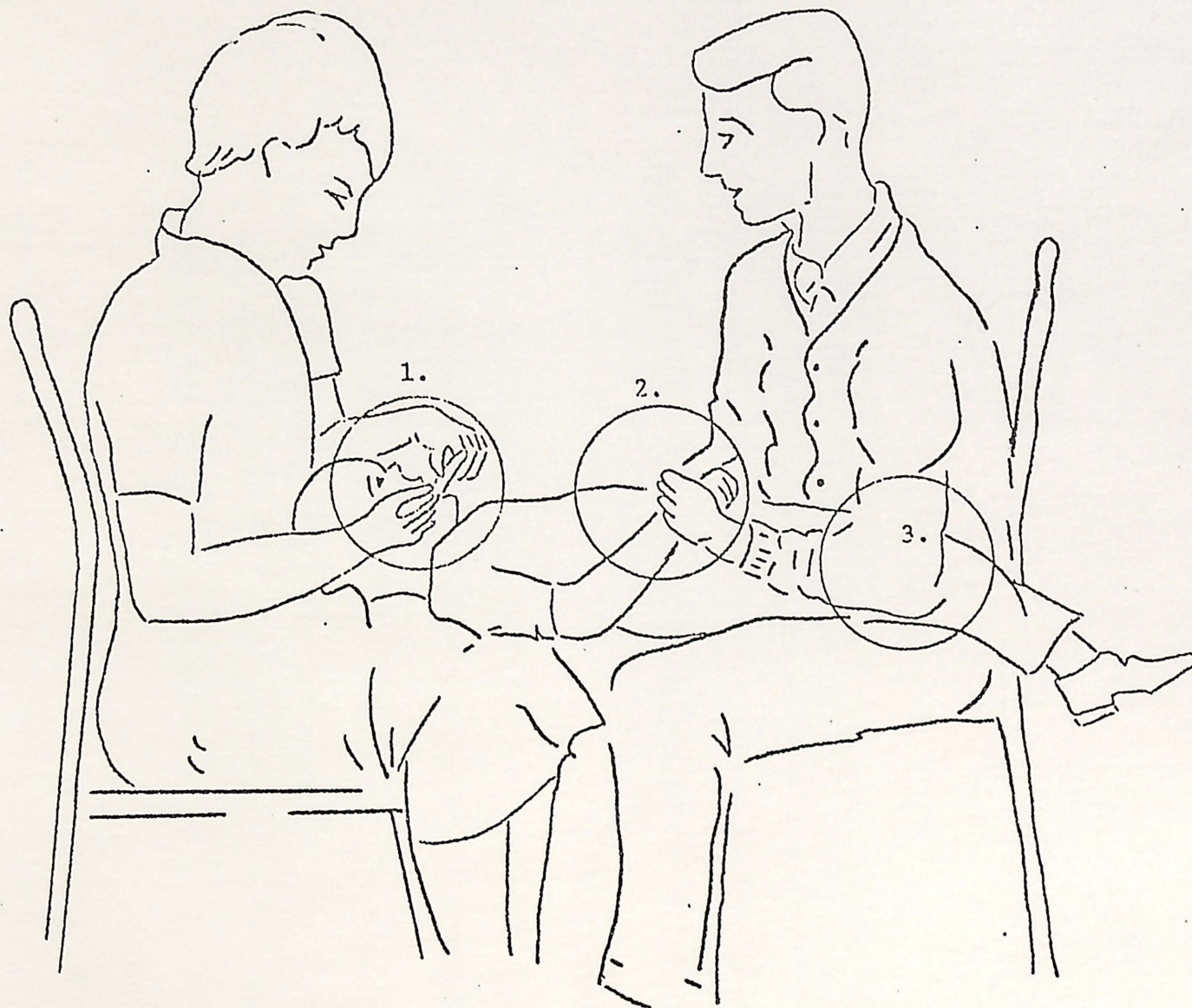
14. The mouth prop is necessary to maintain access to the teeth and ensure the safety of your child's gum tissue and your fingers. The involvement of two people is necessary to restrict all movement. This technique is adapted from the procedures used in the hospital or dental office environment where handicapped children are treated. Developing a home plaque control program is the most important step in preventing dental problems as your child matures. Much of the extensive restorative dentistry that is being performed on children with cerebral palsy could have been prevented if the parents had followed such a program with the pedodontist's guidance. With this program, periodic check-ups are needed only to re-instruct the parent in home plaque control and provide minimal restorative treatment.

To clean your child's teeth is one of the most important responsibilities you have. We want to help you meet that responsibility.



Appendix #6

PICTORIAL REPRESENTATION  
PROVIDED FOR GROUP II



1. one hand brushes, one hand holds mouth  
prop: mother's legs stabilize head.
2. both hands hold both hands of the child.
3. elbows hold legs of the child against the body firmly.
4. child develops a sense of security in this position.
5. brushing can be accomplished in any room in the house.

Appendix #7

DATA SHEET USED IN STUDY

NAME: \_\_\_\_\_ AGE: \_\_\_\_\_ RACE: \_\_\_\_\_

MEDICAL DIAGNOSIS: \_\_\_\_\_

PLAQUE INDEX

Quigly-Hein

	A	B	C	D	E	F	G	H	I	J
Labial										
Lingual										

	T	S	R	O	P	O	N	M	J	K
Labial										
Lingual										

DENTAL EDUCATION LEVEL

Date	Score	Prerequisite Questions	Instructional Objectives	Type of Instruction



JAMES WHITCOMB RILEY HOSPITAL FOR CHILDREN

AGE	SEX	M	F	RACE
-----	-----	---	---	------

PRIMARY MEDICAL DIAGNOSIS

HEAD SHAPE \_\_\_\_\_  
FACIAL SYMMETRY \_\_\_\_\_  
LATERAL FACIAL PROFILE \_\_\_\_\_  
NECK \_\_\_\_\_  
UNUSUAL CRANIAL FACIAL FEATURES \_\_\_\_\_

LIPS \_\_\_\_\_

\_\_\_\_\_

BUCCAL MUCOSA \_\_\_\_\_

\_\_\_\_\_

PALATE \_\_\_\_\_

\_\_\_\_\_

OROPHARYNX \_\_\_\_\_

\_\_\_\_\_

TONGUE \_\_\_\_\_

\_\_\_\_\_

FLOOR OF MOUTH \_\_\_\_\_

\_\_\_\_\_

SALIVARY DUCTS \_\_\_\_\_

\_\_\_\_\_

PERIODONTIUM \_\_\_\_\_

ORAL HYGIENE	GOOD	FAIR	POOR
ORAL HEALTH INSTRUCTIONS _____			
CARIES	NONE APPARENT	PRESENT SEVERE	
MOLAR OCCLUSION	CLASS _____		
CUSPID OCCLUSION	CLASS _____		

DENTAL ALIGNMENT

1. CROSS BITE Rt \_\_\_\_\_ Lt \_\_\_\_\_  
Ant \_\_\_\_\_

2. CROWDING \_\_\_\_\_

3. MAY NEED FUTURE TREATMENT

## ENAMEL DENTIN STRUCTURES

## UNUSUAL DENTAL FEATURES

## CLEFT LIP AND PALATE FEATURES

## SEGMENT ALIGNMENT

## ORAL NASAL FISTULAS

## ORTHODONTIC TREATMENT EVALUATION

1. OCCLUSION STABLE
2. RELAPSE

## ORTHODONTIC TREATMENT

1. NOT INDICATED
2. MAY BE INDICATED
3. IN PROGRESS
4. IN RETENTION
5. COMPLETED

GROWTH RECORDS DUE

DISPOSITION

## SUMMARY

Appendix #9

TEST AND PLAQUE SCORES FOR GROUP I

CODE	To	Po	T <sub>1</sub>	P <sub>1</sub>	To <sub>1</sub>	Po <sub>1</sub>
101	5	5.40	9	4.95	+4	-.45
102	4	10.00	7	8.00	+3	-2.00
103	3	6.45	3	9.20	0	+2.75
104	4	9.20	7	6.90	+3	-2.30
105	4	5.60	6	6.60	+2	+1.00
106	6	9.06	3	7.62	-3	-1.44
107	7	9.75	6	9.70	-1	- .05
108	6	8.05	6	6.35	0	-1.70
109	5	7.80	8	6.80	+3	-1.00
110	4	7.45	5	5.40	+1	-2.05
111	2	6.85	3	3.25	+1	-3.60
112	3	8.37	6	7.05	+3	-1.32
113	3	8.75	7	7.94	+4	- .81

To and Po - Indicate Initial Score

T<sub>1</sub> and P<sub>1</sub> - Indicate Score After Three Months

To<sub>1</sub> Represents Difference in Test Score  $t_o - T_t$

Po<sub>1</sub> Represents Difference in Plaque Score  $P_o - P_1$



Appendix #10

TEST AND PLAQUE SCORES FOR GROUP II

CODE	To	Po	T <sub>1</sub>	P <sub>1</sub>	To <sub>1</sub>	Po <sub>1</sub>
201	4	7.18	9	7.27	+5	+ .09
202	2	6.60	6	5.30	+4	-1.30
203	6	8.50	6	9.50	0	+1.00
204	2	10.00	7	8.21	+5	-1.79
205	6	7.81	3	7.95	-3	+ .14
206	4	4.45	5	5.90	+1	+1.45
207	7	8.40	8	3.60	+1	-4.80
208	2	6.85	4	4.60	+2	-2.25
209	4	7.80	7	4.55	+3	-3.25
210	5	9.82	6	6.75	+1	-3.07
211	5	1.80	7	2.30	+2	+ .50
212	5	9.05	6	8.60	+1	- .45
213	2	10.00	6	5.00	+4	-5.00
214	6	4.50	5	3.80	-1	- .70
215	4	10.00	6	7.00	+2	-3.00
216	4	8.65	4	6.25	0	-2.10
217	3	4.66	9	5.88	+6	+1.22
218	5	6.90	6	6.85	+1	- .05
219	4	6.00	7	6.18	+3	+ .18
220	5	6.35	8	4.95	+3	-1.40
221	3	9.50	7	6.95	+4	-2.55
222	3	9.15	5	7.45	+2	-1.70
223	4	9.10	9	6.55	+5	-2.55
224	2	9.53	3	9.00	+1	- .53

To and Po - Indicate Initial Score

T<sub>1</sub> and P<sub>1</sub> - Indicate Score After Three Months

To<sub>1</sub> Represents Difference in Test Score  $t_o - T$

Po<sub>1</sub> Represents Difference in Plaque Score  $P_o - t_{P_1}$

Appendix #11

TEST AND PLAQUE SCORES FOR GROUP III

CODE	To	Po	T <sub>1</sub>	P <sub>1</sub>	To <sub>1</sub>	Po <sub>1</sub>
301	5	6.40	5	6.30	0	- .10
302	4	5.72	3	5.70	-1	- .02
303	7	7.90	7	7.20	0	- .70
304	5	6.15	5	3.75	0	-2.40
305	3	9.25	4	6.45	+1	-2.80
306	4	6.30	4	5.55	0	- .75
307	2	9.50	5	7.57	+3	-1.93
308	6	6.25	6	4.80	0	-1.45
309	7	7.65	5	6.50	-2	-1.15
310	3	6.10	3	5.50	0	- .60
311	3	10.00	5	3.18	+2	-6.82
312	5	8.10	3	4.90	-2	-3.20
313	3	6.80	3	6.80	0	0.00
314	4	9.00	5	8.58	+1	- .15
315	2	8.33	2	5.00	0	-3.33
316	4	5.00	4	4.40	0	- .60
317	1	7.05	1	4.50	0	- .55

To and Po - Indicate Initial Score

T<sub>1</sub> and P<sub>1</sub> - Indicate Score After Three Months

To<sub>1</sub> Represents Difference in Test Score  $t_o - T_t$

Po<sub>1</sub> Represents Difference in Plaque Score  $P_o - P_1$



Appendix #12

SUBJECTS NOT RETURNING FOR 3 MONTH RECALL IN GROUP I  
AND THEIR SCORES AND PLAQUE DATA

<u>Code</u>	<u>Number</u>	<u>To</u>	<u>Pl<sub>o</sub></u>	<u>N</u>	<u>Mean</u>
	114	2	7.55	12	7.80
	115	4	9.15		
	116	5	10.00		
	117	4	9.90		
	118	4	9.75		
	119	4	7.70		
	120	8	3.95		
	121	4	4.70		
	122	6	8.90		
	123	5	10.00		
	124	5	6.40		
	125	3	5.68		

Appendix #13

SUBJECTS NOT RETURNING FOR 3 MONTH RECALL IN GROUP II  
AND THEIR SCORES AND PLAQUE DATA

<u>CODE</u>	<u>NUMBER</u>	<u>To</u>	<u>Pl<sub>o</sub></u>	<u>N</u>	<u>MEAN</u>
	225	5	6.65	4	5.99
	226	4	4.15		
	227	2	7.65		
	228	1	5.50		



Appendix #14

SUBJECTS NOT RETURNING FOR 3 MONTH RECALL IN GROUP III  
AND THEIR SCORES AND PLAQUE DATA

<u>CODE</u> <u>NUMBER</u>	<u>To</u>	<u>Pl<sub>o</sub></u>	<u>N</u>	<u>MEAN</u>
318	6	10.00	9	7.79
319	6	4.60		
320	0	10.00		
321	2	7.35		
322	3	8.45		
323	2	7.50		
324	1	8.35		
325	3	8.75		
326	4	5.12		

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Professional Societies

American Dental Association  
American Academy Pedodontics  
American Society of Dentistry for Children  
Indiana Dental Association  
West Central Indiana Dental Society  
Delta Sigma Delta Dental Fraternity

## ABSTRACT



EFFECTIVENESS OF ORAL HYGIENE  
INSTRUCTION TO PARENTS OF  
PRESCHOOL CEREBRAL PALSY CHILDREN

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The lack of an effective method for teaching oral hygiene procedures to parents of handicapped children prompted this investigation. Seventy-nine preschool cerebral palsy children were randomly distributed according to age and sex into three groups. The parents of these groups received the following instruction: Group I - written instructions for a detailed approach to oral hygiene maintenance in the home as if the child were without handicap; Group II - written instructions for a specialized approach to home oral hygiene maintenance with emphasis on two people providing the care, and mouth propping for access and stability of the arms and legs; Group III - no specific oral hygiene instructions.

Each child in each group received a thorough oral examination and deposits of dental plaque were disclosed, numerically scored and recorded. Each parent of the three study groups participated in a written examination of dental knowledge at each visit. After each examination, the correct answers were given to the parent by both a verbal and written response. Parents and children returned at 90-day intervals.

Variables such as transportation, surgery performed during the period of study, deteriorating health in the child, parental apathy about dental problems, and change in family job or location, reduced the sample from seventy-nine to fifty-four subjects, with data being obtained for pre- and post- examination periods. Both test group of parents significantly improved their dental knowledge scores after ninety days. However, none of the children decreased their plaque enough to show statistical significance. Perhaps there was some motivational improvement in the Group II parents, as they returned for the examination at a better rate, judged to be significant as compared to the other groups.

Further investigation is recommended either to study the technique by itself without a time interval between scores or to evaluate the factors of intelligence, economic level, gravity of medical situation, and sibling support as they offset changes in behavior. Until then, it appears on the basis of this study that it is possible to increase the parent's knowledge of oral health but that changing the behavior of the parent actually performing the task is much more difficult.