

Impact evaluation of an oral health intervention amongst primary school children in Ireland

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SUMMARY

A pilot oral health programme was developed which aimed to improve dental health knowledge and behaviour amongst Irish school children aged 7–12 years. The programme comprised two integral components: a television campaign, run over a 6-week period, was incorporated into the children's programme 'Den TV' on national television, with video clips of a member of the music band Boyzone promoting key oral health messages; and a Smile of the Year contest. Concurrently, a dental nurse delivered an interactive talk with pupils, showed a video of the Den TV oral health programme and distributed posters and leaflets. The aim of this study was to assess the impact of the overall intervention on school pupils' dental health knowledge and

reported behaviour. Thirty-two primary schools in two health board regions in the Republic of Ireland participated in the study. At baseline and after 6 weeks, 1534 school children completed specially developed questionnaires. There was a positive net effect of the dental nurse intervention in all but one question. The percentage of children who reported using the recommended amount of toothpaste and brushing for 3 min appeared to have been further increased having observed the television campaign. These results are in line with the argument that mass media campaigns work to supplement the one-to-one activities of health professionals in order to effect knowledge and behavioural change.

Key words: health professional; mass media; oral health intervention; school children

INTRODUCTION

It is widely recognized that good oral health practices are necessary from a young age to ensure positive long-term dental health and hygiene (Department of Health and Children, 1999). Too frequent consumption of foodstuffs containing non-milk extrinsic sugars and a lack of fluoride have been clearly identified as two of the main contributors to the development of dental caries (Arens, 1999). Whilst Ireland remains a bastion of water fluoridation since 1963, a study carried out by the Eastern Health Board of the Republic of Ireland in 1997 identified that only 67% of 5-year-olds were caries-free [Eastern Health Board (Dublin) *Dental Health Report 1997*, unpublished]. The level of caries differed between fluoridated and non-fluoridated areas in other health board regions. In the Mid-Western

region, 75% of children aged 8 years living in fluoridated areas were caries-free compared with 62% of those in non-fluoridated areas. Inadequate oral health maintenance was also identified amongst 8- and 15-year-olds throughout the country (North Eastern Health Board, 1995; Southern Health Board, 1995; Mid-Western Health Board, 1997).

Positively influencing the knowledge, attitude and behaviours of children towards sustainable good oral health requires an integrated health education and health promotion approach. Basic behaviour change theory such as the Social Learning Theory (Bandura, 1977) and the Health Belief Model (Becker, 1974) suggests that changes in knowledge, attitudes and behaviour may be brought about using a concerted approach

involving mass media, community and individual interactions. The effectiveness of media campaigns is enhanced when reinforced by individual interaction (Bakdash *et al.*, 1983) and further to this, the combined approach of media supported by a health professional input has been shown to effect sustained behaviour change (Flay, 1987). This was further supported by Reid, who followed an assessment of the different forms of health education in the UK and concluded that interpersonal education alone has limited capacity in producing large population shifts, whereas combined with mass communication it can contribute effectively to the promotion of health (Reid, 1996). More specifically, mass media has been identified as a possible vehicle for dental health education at a national level (Schou, 1987), and it can provide information and increase the awareness of individuals with respect to specific issues (Rise and Sogaard, 1987).

Until recently, despite the poor oral health behaviours and substantial prevalence of caries amongst Irish school children, there have been few programmes dedicated to the improvement of dental health amongst this target group. The importance of dental hygiene was encouraged for a number of years through a dedicated time slot in a children's television programme, but no formal evaluation was ever undertaken. Dietary interventions that do incorporate messages about food-stuffs that are good for teeth have been successfully developed and implemented throughout primary schools at the national level, but the primary focus is on healthy eating in general and does not relate specifically to oral health (Friel *et al.*, 1999). Subsequently, the Dental Health Foundation, Ireland, which has a health education and promotion brief, developed an integrated intervention programme for school-going children aged 7–12 years, combining dental health professional involvement and oral health messages portrayed through mass media. The Centre for Health Promotion Studies undertook an impact evaluation of this pilot oral health intervention in school children, the results of which are the focus of this paper.

METHODS

Intervention

The aim of the intervention programme was to increase awareness and knowledge of the

importance of oral health maintenance among 7- to 12-year-olds and to effect a positive behaviour change. The key oral hygiene messages were: to brush with fluoride toothpaste and use a pea size amount of it, to brush for 3 min at least twice a day, and also to replace toothbrush 'when bristles start to get out of shape'. The programme consisted of a school dental nurse intervention simultaneously given against the backdrop of a national television campaign through a mainstream children's afternoon programme.

The television campaign was based around a *Smile of the Year* competition, which was incorporated into a daily children's programme, 'Den TV'. The competition was used as a vehicle for a concentrated fun and educational campaign based on the key oral hygiene messages, to find Ireland's best smile. A Smile Scout, who was a member of the well known Irish music band Boyzone, launched the campaign and encouraged the children to look after their teeth and send in a picture of their smile. Pre-produced video clips of the Smile Scout together with the Den TV presenter and team were shown each day for 6 weeks on the television programme promoting the campaign's key oral hygiene messages and was complemented further by live on-air promotion. The competition ran over the 6 week period, after which eight finalists and their families were invited to the television studios to be judged on air by the Den TV team.

The dental health nurse intervention consisted of an interactive talk with the pupils around the key messages, plus a 6 minute video incorporating the Smile Scout and Den TV presenters promoting the key oral health messages, along with posters and leaflets supporting the *Smile of the Year* competition. In each health board, the dental health nurse was part of the Public Dental Service team and had previous training in health education.

Sample

All primary schools within the Western and Eastern health board regions in Ireland provided the sample framework for this pilot study. A cross-sectional sample of these schools was selected to reflect the spectrum of primary schools (eight categories) under the jurisdiction of the Department of Education: urban/rural, small/large, single sex/mixed and disadvantaged/mainstream. There were 32 randomly chosen schools in total. A random selection of four

urban, four rural, two small, two large and four disadvantaged schools was made from the Department of Education school listings in each of the participating health boards. Within each board area, the selected schools were then randomly assigned to intervention or control status, resulting in 16 intervention and 16 control schools in total. One junior class representing 7-/8-year-olds and one senior class representing 11-/12-year-olds was required from each school. Pupils present on data collection day were deemed subjects.

Design

The impact evaluation study was designed to assess the effectiveness of the dental health programme consisting of a school dental nurse intervention against the backdrop of a national television campaign through a mainstream children's afternoon programme. An experimental/control, pre-/post-design was used for the school nurse intervention, taking into account reported exposure or not to the television campaign. Schools assigned to the experimental group received the dental nurse intervention during the television campaign time period. The intervention took place at the start of the school year in mid-September. Immediately before, the dental nurse delivered the intervention; on the same day a baseline questionnaire was completed in the classroom situation, followed by a post-test questionnaire survey in the same classes 8 weeks after the 6-week intervention programme finished. Control children were also visited by the dental nurse before the intervention programme began, but were only asked to complete the baseline questionnaire. They were then visited again 8 weeks after the intervention programme finished. Following the intervention time period and post-test survey, the dental nurse delivered the intervention programme to the control school children. The results of the *Smile of the Year* competition were televised shortly before Christmas.

Measures

A self-administrated questionnaire was designed, one for seniors (11-/12-year-olds) and one for juniors (7-/8-year-olds), which had graphics to aid in their comprehension of the questions. These were completed during a class period under the supervision of the dental nurse and a teacher. A total of 15 questions for the younger children

and 18 for the older ones were included in the questionnaire, following its pre-test with children of a similar age who provided feedback on their understanding and ease of use. Oral hygiene experts assessed the measures for their content validity. The questions reflected the five key messages of the campaign in relation to the frequency and duration of brushing teeth, the amount and type of toothpaste and when to replace a toothbrush. Information was also obtained on the time of day children brush, who taught them how to brush, the effect of sweet food on teeth and their experience with the dentist. At post-test, additional questions were included relating to their exposure and recall of the television campaign. The children were asked what evenings of the week they watched television and whether or not they watched Den TV.

ANALYSIS

The key messages formed the criteria of the data analyses. Those children who received the dental nurse intervention are classified as experimental and those who did not as controls. Exposure to the television campaign was determined based on an affirmative response to the question of whether pupils watched Den TV or not. χ^2 analyses were conducted on the nominal level frequency data to test for differences in responses between groupings. First, differences between experimental and control children responses to key questions at baseline, prior to intervention exposure, were tested. Differences in responses between baseline and post-test were then tested for in experimental and control children separately. Due to the differential in urban/rural and male/female responses pre- and post-intervention, the Mantel Haenzel χ^2 statistic was utilized to control for potential confounding. The net effect of the intervention programme was estimated by subtracting the percentage change pre- to post-intervention in control children from that for the experimental children. The post-intervention data were then separated into those who did and those who did not see Den TV, and within each of these groups, differences checked for between experimental and control children. Differential gender responses between experimental and control groups at post-test were controlled for using Mantel Haenzel χ^2 analysis. Data analysis was undertaken using the SPSS Version 9.0 statistical package.

RESULTS

Table 1 shows the demographic characteristics of each class group at baseline and post-intervention. There were 1534 responses to the baseline questionnaire: 769 experimental (50.1%) and 765 (49.9%) control. Slightly more experimental children responded post-intervention: 743 (53%) experimental and 659 (47%) controls. The differences in gender and locality of dwelling breakdown pre- and post-intervention in both the intervention and control children were controlled for in all analyses using Mantel Haenzel χ^2 analyses. Overall percentages are reported in each table with the corresponding Mantel Haenzel χ^2 (χ^2_{MH}) in the text.

At baseline, responses to the questions relating to the key messages of the dental health campaign were similar in both experimental and control children, except with regards to the perception of fluoride in toothpaste (Table 2). Significantly more of the experimental older children thought fluoride toothpaste was beneficial to oral health compared with their control counterparts ($\chi^2_{MH} = 10.67, p < 0.01$). The majority of children, both younger (experimental 75%, control 73%) and older (experimental 88%, control 86%), agreed that eating sweet foods and drinking sweet drinks could be harmful for their teeth.

Following the dental health intervention, significant differences were found between the dental health behaviour of experimental and control children in both the junior and senior class groups (Table 2). In the younger age group, significantly more experimental children reported

brushing their teeth for 3 min ($\chi^2_{MH} = 54.01, p < 0.01$) and were more likely to use a pea-sized amount of toothpaste ($\chi^2_{MH} = 87.63, p < 0.01$) after the intervention compared with baseline. Whilst significantly more control children also reported brushing for at least 3 min, the change was substantially greater amongst experimental children (Table 3). More control children reported replacing their toothbrush when the head started to get out of shape after the intervention time period compared with baseline ($\chi^2_{MH} = 7.56, p < 0.01$). As shown in Table 3, in three of the four behaviours there appeared to be a net positive effect of the intervention amongst the younger children.

Similar patterns of reported change in behaviour were observed amongst the older experimental children as in the younger ones. Post-intervention, significantly more reported brushing their teeth for at least 3 min ($\chi^2_{MH} = 31.86, p < 0.01$) and higher numbers used a pea-sized amount of toothpaste ($\chi^2_{MH} = 112.3, p < 0.01$). The high level of agreement that fluoride was a better type of toothpaste in the experimental group at baseline increased significantly post-intervention ($\chi^2_{MH} = 24.41, p < 0.01$). Whilst there were significant changes over the intervention time period in the number of control children using a pea-sized amount of toothpaste and reporting that fluoride toothpaste was a better type of toothpaste, the net effect was in favour of the experimental children for these measures, as it was for all but one of the other measures (Table 3). There was very little change in the proportion of older children who agreed that eating sweet

Table 1: Demographic characteristics of respondents at baseline and post-intervention

	Baseline				Post-intervention			
	Experimental (<i>n</i> = 769)		Control (<i>n</i> = 765)		Experimental (<i>n</i> = 743)		Control (<i>n</i> = 659)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Class								
7-/8-year-olds	414	54	376	49	365	50	321	49
11-/12-year-olds	355	46	389	51	362	50	333	51
Gender								
Males	471	61	398	52	393	53	415	63
Females	298	39	367	48	346	47	242	37
Locality of dwelling								
Urban	523	68	362	48	437	60	388	59
Rural	243	32	398	52	291	40	268	41

Classroom, gender and locality of dwelling cells are not mutually exclusive. Some cells may not add up to column total due to item non-response.

Table 2: Percentage responses to the five key oral health questions broken down by age group, group status and time

	Aged 7/8 years (<i>n</i> = 1477)				Aged 11/12 years (<i>n</i> = 1439)			
	Experimental (<i>n</i> = 779)		Control (<i>n</i> = 698)		Experimental (<i>n</i> = 717)		Control (<i>n</i> = 722)	
	Baseline (<i>n</i> = 414)	Post-test (<i>n</i> = 365)	Baseline (<i>n</i> = 376)	Post-test (<i>n</i> = 321)	Baseline (<i>n</i> = 355)	Post-test (<i>n</i> = 362)	Baseline (<i>n</i> = 389)	Post-test (<i>n</i> = 333)
Brush teeth at least twice per day	72.0	76.5	68.6	68.3	66.8	72.7	68.4	69.9
Brush teeth for 3 min	14.4	39.6 ^a	12.6	24.4 ^a	28.0	50.8 ^a	29.1	29.4
Use pea-sized amount of toothpaste	14.5	46.5 ^a	15.8	21.5	14.7	54.0 ^a	16.3	31.4 ^a
New toothbrush	57.5	58.0	56.2	64.6 ^a	82.2	78.6	80.7	83.7
Positive fluoride	NA	NA	NA	NA	52.1 ^b	70.8 ^a	38.5	52.0 ^a

^a*p* < 0.01: differences between baseline and post-test in each grouping, controlling for variation in gender and locality of dwelling distributions.

^b*p* < 0.01: difference at baseline between experimental and control groups, controlling for variation in gender and locality of dwelling distributions.

NA, not asked.

Table 3: Percentage change in responses to the five key oral health questions, pre- and post-intervention, broken down by age group

	Aged 7/8 years			Aged 11/12 years		
	% difference		Net effect of intervention (% change)	% difference		Net effect of intervention (% change)
	Pre-post experimental	Pre-post control		Pre-post experimental	Pre-post control	
Brush teeth at least twice per day	+4.5	-0.3	+4.8	+5.9	+1.5	+4.4
Brush teeth for 3 min	+25.2	+11.8	+13.4	+22.8	+0.3	+22.5
Use pea-sized amount of toothpaste	+32.0	+5.7	+26.3	+39.3	+15.1	+24.2
New toothbrush	+0.5	+8.4	-7.9	-3.6	+3.0	-6.6
Positive fluoride	NA	NA	NA	+18.7	+13.5	+5.2

NA, not asked.

foods and drinking sweet drinks could be harmful for their teeth after the dental nurse intervention. The number of both intervention and control children who agreed sweet foodstuffs were harmful for teeth increased significantly post-intervention (experimental 83%, control 84%).

Subsequent analyses were limited to post-test data in order to identify the impact of the dental nurse intervention plus having viewed the television programme compared with just receiving the dental nurse visit. Analyses were therefore stratified within the intervention and control groupings for those who did and did not report that they watched Den TV, and differing gender

distributions between the experimental and control groups were controlled for using Mantel Haenzel χ^2 (Table 4). Seventy-eight per cent (*n* = 537) of the younger and 48% (*n* = 331) of the older children reported having seen Den TV.

Those younger children who received the nurse visit and also saw Den TV were significantly more likely to brush for 3 min ($\chi^2 = 5.99$, *p* = 0.014) and reported using a pea-sized amount of toothpaste ($\chi^2 = 3.71$, *p* = 0.054) compared with those who did not see Den TV. The trend was similar, though statistically insignificant, for other behaviours. Significantly more older children who received the nurse visit and saw Den TV used the recommended amount of toothpaste ($\chi^2 = 14.59$,

Table 4: Percentage response to the five key oral health questions broken down by age group, experimental status and whether subjects viewed Den TV or not (post-intervention only)

	Aged 7/8 years (<i>n</i> = 686)				Aged 11/12 years (<i>n</i> = 695)			
	Experimental (<i>n</i> = 365)		Control (<i>n</i> = 321)		Experimental (<i>n</i> = 362)		Control (<i>n</i> = 333)	
	Den TV (<i>n</i> = 299)	No Den TV (<i>n</i> = 57)	Den TV (<i>n</i> = 238)	No Den TV (<i>n</i> = 80)	Den TV (<i>n</i> = 188)	No Den TV (<i>n</i> = 166)	Den TV (<i>n</i> = 143)	No Den TV (<i>n</i> = 171)
Brush teeth at least twice per day	78.0 ^c	68.4	68.2	67.5	72.6	73.9	70.6	70.2
Brush teeth for 3 min	42.5 ^{a,d}	25.0	23.9	25.3	54.1 ^d	47.9	28.7	30.1
Use pea-sized amount of toothpaste	49.0 ^{a,d}	35.1	24.8 ^a	12.5	64.0 ^{b,d}	43.6	32.4	32.1
New toothbrush	59.5	47.4	64.1	65.8	74.5	82.2	83.9	84.3
Positive fluoride	NA	NA	NA	NA	75.9 ^{a,d}	65.5	53.6	50.9

^a*p* < 0.05, ^b*p* < 0.01: differences between children who saw Den TV and those who did not, within each age group and experimental status.

^c*p* < 0.05, ^d*p* < 0.01: differences between experimental and control children who saw Den TV, controlling for variations in gender distribution.

p < 0.01) and agreed fluoride toothpaste was better ($\chi^2 = 4.68$, *p* = 0.03) compared with those who did not see Den TV. There were no significant differences amongst older control children.

Amongst those children who reported seeing Den TV, there were a number of behaviours for which significantly more experimental children compared with controls reported the better option. A higher percentage of those younger children who received the nurse visit and saw Den TV, compared with those who only saw Den TV, reported brushing their teeth at least twice per day ($\chi^2_{MH} = 3.91$, *p* = 0.05), brushed for at least 3 min ($\chi^2_{MH} = 16.67$, *p* < 0.01) and used a pea-sized amount of toothpaste ($\chi^2_{MH} = 28.33$, *p* < 0.01). Significantly more of the older children who saw Den TV compared with those who had not reported brushing for at least 3 min ($\chi^2_{MH} = 19.77$, *p* < 0.01), used a pea-sized amount of toothpaste ($\chi^2_{MH} = 30.42$, *p* < 0.01) and agreed fluoride toothpaste was better ($\chi^2_{MH} = 16.84$, *p* < 0.01). The proportions of children who agreed that eating sweet foodstuffs was harmful for their teeth did not vary significantly between those who did and did not see the Den TV programme in any of the groupings.

DISCUSSION

There are two main findings from this study. Positive changes were observed in a number of the reported dental health knowledge and

behaviours of school children after the dental nurse intervention. Changes in two of the behaviours appeared to have been further complemented amongst those who reported having seen the Den TV national media campaign, but the campaign in itself had little apparent impact on control children. This is an important finding in that it explores the interaction of two types of intervention and suggests the value of settings-based approaches such as schools health education to complement media campaigns proposed in the behaviour change theory discussed earlier (Becker, 1974; Bandura, 1977). Positive health findings have been reported in the literature where television campaigns have been used. On its own such a campaign was found to increase knowledge and reinforce attitudes, whilst sustained knowledge and behaviour effects were identified after subjects had visited dentists during the campaign time period (Bakdash *et al.*, 1983; Rise and Sogaard, 1988). Similar outcomes were observed in national media campaigns promoting other health-related topics such as HIV awareness (Sixsmith *et al.*, 2000) and physical activity, with short-term effects reported on behaviour. These were especially useful when used as a backdrop to more in-depth community level or interpersonal interventions (Cavill, 1998). McGovern and colleagues found improved awareness and use of folic acid dietary supplements following combined health education from health professionals and mass media campaigns (McGovern *et al.*, 1997).

There are of course limitations to this type of study. As mentioned in the methodology section, contamination of the control children by the media campaign was unavoidable using this approach, but was controlled for to some extent at the analysis stage. There were no objective measures of change in dental health status but simply self-reported outcome measures relating to awareness, knowledge and behaviour. This, however, is very much in keeping with health promotion research, where intermediary risk factors are often the primary focus with the understanding that they will in turn help effect long-term behaviour change and health outcome. There was a limited follow-up period of 8 weeks after the intervention, which may not allow for maturation of the dental health messages, a limitation also identified in other dental health education literature (Rise and Sogaard, 1988; Brown, 1994; Locker and Kay, 1996). Whilst it is generally believed that mass media programmes alone are unlikely to achieve sustained behaviour change (Tones, 2000), assessment of the combined intervention approach may require longer-term follow-up. The short time for re-surveying may also increase the likelihood of positive recall bias amongst the experimental pupils. Good diet and nutrition plays a crucial role in the maintenance of good dental health. The international survey on health behaviour in school children aged 11–17 years identified the Republic of Ireland as being among the top three countries for children reporting daily consumption of sweets or chocolate (HBSC, 1999). This topic was not addressed in detail in this particular study.

Overall, however, the dental health intervention programme developed by the Dental Health Foundation in Ireland can be seen, through this evaluation by the Centre for Health Promotion Studies (National University of Ireland, Galway), to have had a positive effect on a number of the reported dental health practices and knowledge of school children between the ages of 7 and 12 years. With a more extensive intervention programme and longer-term follow-up, this approach of combined health professional involvement with mass media has potential merit in bettering the oral health of Irish school children.

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