International Journal of Dental Hygiene

Official Journal of the International Federation of Dental Hygienists

ORIGINAL ARTICLE

CH Reinhardt
MJ Noack
G Wassmer
J Dumit
A Rolfs
K Klein

Comparison of three forms of teaching – a prospective randomized pilot trial for the enhancement of adherence

Authors' affiliations:
CH Reinhardt, Department of Biology Teaching, State Teacher Training Center, Köln, Germany
CH Reinhardt, *MJ Noack*, Centre of Dental Medicine, University of Cologne, Köln, Germany
G Wassmer, Institute of Biostatistics, Informatics and Epidemiology, University of Cologne, Köln, Germany
J Dumit, Science Technology and Society Department, Massachusetts Institute of Technology, Cambridge, MA, USA
A Rolfs, Albrecht-Kossel-Institute for Neuroregeneration, University of Rostock, Rostock, Germany
K Klein, Institute of Biology and Biology Teaching, University of Cologne, Köln, Germany

Correspondence to:
Dr C. H. Reinhardt
Department of Biology Teaching
State Teacher Training Center
Barthelstr. 36
50823 Köln
Germany
E-mail: drcreinhar@aol.com

Abstract: *Objective:* Adherence of young adults to preventive programmes is low. The following study compares three different educational concepts to increase toothbrushing adherence in young adults. *Methods:* Nine vocational school classes (157 young adults) were randomly assigned to three different 60-min approaches: (I) Education by a dentist, (II) Peer-teaching and (III) 'Adherence triangle concept' uniting dentists, teachers and participants as equal partners in intervention planning combined with peer teaching. Follow-up was 1 week for approaches I and II, and 1 week, 3 and 9 months for approach III. Adherence was defined as reported change from the childhood toothbrushing technique to adult technique. Adherence was evaluated using anonymous questionnaires and by diary analysis. *Results:* After instruction, 90% of participants (approaches I–III) showed the desired behaviour in practice and theory. Reported adherence after 1 week with approach I was 28.5%, with approach II 39% and with approach III 95%. Prolonged follow-up of approach III yielded 76% after 3 months and 68% after 9 months. Adherence using approach III was significantly higher ($P \leq 0.001$) than using approach I and II after 1 week. Adherence rates with approach III after 9 months were still higher than those of approaches I and II after 1 week. *Conclusions:* The 'adherence triangle' concept enhanced reported adherence significantly in comparison with previous studies and the one-dimensional concepts of approaches I and II. The tools of the adherence triangle concept seem worthwhile to be considered when planning new preventive action.

Key words: collaborative approach; research; compliance; dental hygiene counseling; educational systems; motivation; school based preventive programs

Dates:
Accepted 7 December 2011

To cite this article:
Int J Dent Hygiene **10**, 2012; 277–283
DOI: 10.1111/j.1601-5037.2011.00543.x
Reinhardt CH, Noack MJ, Wassmer G, Dumit J, Rolfs A, Klein K. Comparison of three forms of teaching – a prospective randomized pilot trial for the enhancement of adherence.

Introduction

Prophylactic measures should be one of the cornerstones of dentistry, especially in the young. In Germany, pupils benefit from group prophylaxis measures in nursery and primary schools explaining the importance of fluoridation, nutrition and regular dental visits. Moreover, pupils learn appropriate toothbrushing methods. At this age, mostly the Fones toothbrushing technique is taught (1). In this study, we focus on the delivery of the next step: acquisition of the Bass toothbrushing method to ameliorate mechanical plaque removal. According to the American Dental Association and others, young adults should adopt the modified Bass

technique (1). The advantage of the modified Bass technique is that it allows the removal of more plaque than the Scrub and the Fones technique, especially in dental sulci and interdental spaces (1). Unfortunately, adoption of the modified Bass technique hardly occurs; more than 75% of adults still employ childhood toothbrushing methods (2). The main reason for this non-adoption is that prophylaxis mainly depends on patients' adherence, which is rather low with medical and dental programmes (3, 4). In general, only 50% of patients are considered to be compliant and in preventative interventions no more than 25% (5). Closer analysis of patients' adherence in different age groups shows that adherence in early adulthood is even lower, because young adults tend to challenge medical advice (6) and do not perceive vulnerability (7, 8). A further important reason for non-adoption of the modified Bass technique is that it requires a certain degree of skill and is quite difficult to learn. Traditionally dentists and dental hygienists deliver the modified Bass technique individually and in a specialist-centred manner. This method of delivery is expensive, but, nonetheless, not very effective (3).

For this study, we designed and evaluated new ways of delivery from an educational point of view. The setting for this study was a commercial vocational school with a section for medical and dental assistant trainees. In cooperation with local teaching staff, a dentist-centred (I) and a peer-teaching (II) approach were designed. Moreover, as part of the dental assistant training programme, a new approach (III) was developed cooperatively joining dentists, teachers and dental assistant trainees as equal partners.

Aim of this study was to compare these three approaches regarding self-reported adherence.

Material and methods

This section has been divided in two parts. The first part describes terms and conditions that applied for all three approaches and the second one presents each approach in detail. Aiming a medium effect in compliance rate and a significance level of 0.05, a sample size of 50 persons for each approach (I–III) was chosen that is enough for roughly reaching 80% power (9). Finally 157 young adults, mean age 19.7 ± 2.5, all attending vocational commercial schools in Bonn, were invited to take part in this study.

Informed consent was a prerequisite for participation. The research hypothesis, however, was unknown to all participants to avoid confounding. College's Institutional Review Board and the Review Board for Dental Hygienists approved the protocol.

Exclusion criteria were as follows: wearing of dental braces and presence of motor deficiencies (plaster immobilization, psychomotor diseases). Moreover, all participants who could demonstrate that they practiced the modified Bass brushing technique correctly were excluded from this study. Participants belonged to nine school classes. Socio-economic status of all participating classes on the class level was assessed (see Table 1). Because of some resistance for the assessment of socio-economic status, this was evaluated using anonymous questionnaires. Three groups each consisting of three classes with comparable socio-economic status were created and then assigned at random to approach I–III (see Fig. 1). This procedure, which was described by Sejr and Osler (10), uses the class as unit of randomization. Classes participating in approaches I and II were 100% female. In approach III, two classes were 100% females and one of the classes was mainly male (80%) to evaluate differences attributable to gender.

Table 1. **Study population National Statistics socio-economic classification**

	Approach I	Approach II	Approach III
Mean age	19.8 ± 2.3	19.5 ± 2.4	19.9 ± 2.5
Sex (%)			
Female	100	100	71
Male	0	0	29
School education: vocational school (%)	100	100	100
Years of school education	9.7 ± 0.6	10 ± 0.95	10.2 ± 1
Socio-economic classification parents (%)			
Higher managerial and professional	6	9	10
Lower managerial and professional	16	15	17
Intermediate employee	16*	30	32*
Small employers and self employed	20	15	12
Lower supervisor and craft	12	13	7
Semiroutine employee	16	9	12
Routine employee	12	9	5
Economically inactive	0	0	4

*Greatest difference ($P = 0.086$).

All three approaches were set in school premises and during school time according to curricular guidelines. Media and denture models were borrowed from school stocks. The intervention for all three approaches took place in a large class room. All members of approach I–III were evaluated by a final exam regarding practical and factual knowledge. Factual knowledge was assessed individually with a standardized written class test that had been tested before with young adults of the same age group to ensure comprehensibility (11). This written test assessed caries theory and key concepts of the modified Bass toothbrushing technique. The practical knowledge (i.e. the ability to perform the modified Bass method) was evaluated by video supervision: All subjects were filmed, and their toothbrushing abilities were evaluated by distinct expert personnel for at least two minutes per participant. Angle of the filaments, vibration, sweeping the filaments over the crown and the systematic procedure were evaluated.

Interpretation was carried out using the systematic scoring described by Cohen (12).

In all three approaches, the delivery was performed by the same dentist. This dentist was part of the regular teaching staff for dental assistant trainees, and teaching prophylaxis was

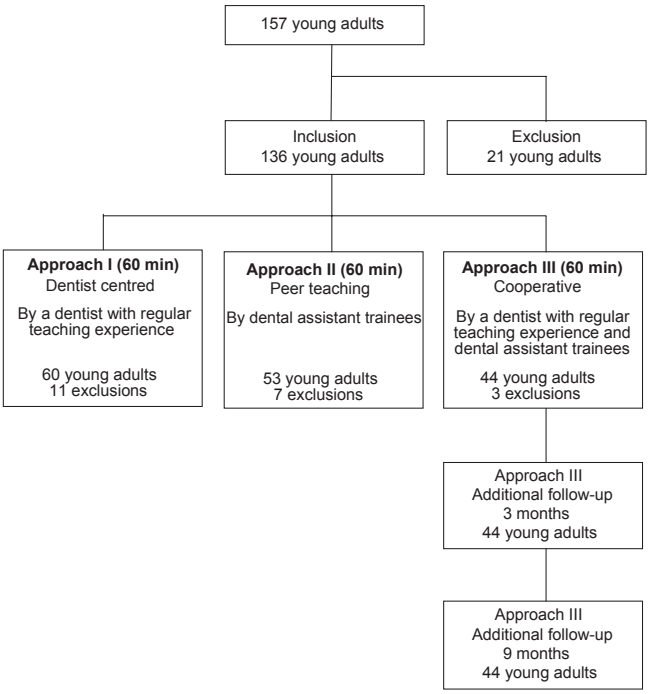

Fig. 1. Summary study population.

part of his regular duty. Additional costs for each approach consisted of single-use articles for dental hygiene, video-cassettes, promotion flyers and catering, which were 200€, respectively.

Primary endpoint for each approach was a self-administered anonymous quantitative questionnaire that assessed adherence. Adherence was defined as percentage of young adults who adopted the toothbrushing technique (modified Bass technique). The endpoint questionnaire was tested for validity and reliability by parallel classes of the same age group and comparable socio-economic status prior to delivery the participants. The questionnaire consisted of open and closed questions concerning the behavioural change (adoption of the modified Bass technique). Closed-ended questions used multiple-choice answers, which included one inconclusive possibility to be specified. Open questions asked for individual reasons for the stated behaviour. Moreover, these open-ended questions were used for intern validity: answers to closed-ended questions were re-checked by the answers of the open-ended questions. In case of inconclusive answers, the corresponding open-ended question was opted for. Items were evaluated for the first day after intervention and the subsequent week. Each approach had a follow-up of at least 1 week.

In all three approaches, the learners evaluated the teaching capacity of those who taught them directly, that is, the dentist in approach I, and in approach II and III the peers. The teaching capacity was evaluated by anonymous questionnaires after completion of the course. The questionnaire consisted of closed-ended and open-ended questions.

The following part will describe each approach in detail.

I. Dentist-centred approach

Three classes of dental assistant trainees (60 students mean age 19.8 ± 2.3, 11 exclusions) were invited to take part. The dental assistant trainees were taught the modified Bass technique in theory and practice in a project-like manner. This method encourages students to find out key factors for themselves using textbooks and visual aids. Dynamic topics were presented by video. The modified Bass technique was exercised by auto-correction in groups of three employing denture models. The delivery of the dentist-centred approach itself took 60 min. Evaluation was performed as described previously.

II. Peer-teaching approach

Peer teaching was performed by dental assistant trainees who had successfully passed a theoretical and practical assessment. Tutoring was performed in a face to face two-to-two manner (two dental assistant trainees with two young adults). To ensure standardized instruction, dental assistant trainees followed an instruction manual that had been elaborated by themselves in the class previously. The instruction manual was elaborated using cooperative methods.

Fifty three young adults (7 exclusions, mean age 19.5 ± 2.4) were invited for peer teaching. These young adults were from different school sections with no relation to dentistry. The delivery of the peer teaching took 60 min. Evaluation was performed as described previously.

III. Adherence triangle approach

The aim of approach III was to bring together the expertise of all the parts concerned; that is, dentists, teachers and young adults. Each part made suggestions (that will be detailed later) how the delivery of the modified Bass method could be changed to increase adherence.

How the adherence triangle worked

The young adult's main contribution focused on aspects of how to increase attractiveness of oral care for their peers. They made clear that for young adults, the most important topic concerning oral health was how to increase attractiveness when dating [a fact which had also been identified by McGregor before and which he called 'kissing attractiveness' (7)]. According to this suggestion in approach III, the 'kissing attractiveness' was stressed by images of apparently clean teeth that were treated afterwards with a plaque indicator and images of enlarged plague as well as a specially designed 4-min motivation film that showed how important 'kissing attractiveness' is in life. This motivation film was conceptualized and realized by commercial students of this school in a project-like manner according to curricular guidelines.

The teacher's contribution focused on the methods of delivery. First of all compared with approach I, factual information was largely diminished to the acceptable minimum. Moreover, this information was summarized on an information sheet. Secondly, actual learning opportunities were increased: Topics of instruction were broken down into smaller learning steps and more controls were introduced. More time was spent on exercising the modified Bass method on the denture model and toothbrushing. Moreover, young adults were provided with a possibility to check whether their own teeth felt clean. This was performed by a tongue check.

The dentists ensured that contents were still medically correct. Moreover, they reviewed strategies of former health promotion studies. One important point for adherence is tailoring (13–15). Therefore, dental assistants asked the young adults their personal attitudes and problems to tailor their instruction. Eventual maintenance problems at home were treated extensively, and individual strategies of how to cope with them were developed.

A second point was the introduction of a diary. The diary was designed as a motivation tool and was to help circumvent problems typically encountered during the first week. Moreover, the diary was intended for evaluation, and therefore, young adults were asked to return the diary for evaluation after 1 week.

The proposals of each partner (young adults, teachers, dentists) were negotiated until it was acceptable to all. This procedure was quite time consuming, but was still according to curricular guidelines, because all school subjects of the dental assistant trainees could be integrated in a project-like manner.

Description of the adherence triangle approach

The final approach embraced some revised parts of approach I (dentist centred) and II (peer teaching) which is detailed later: The introduction took parts of approach I. The introduction was dentist-centred. However, as stated previously, motivational aspects were stressed, and the lecture was shortened. The redesigned introduction, including the film, took 30 min. The second part of approach III used the peer teaching of approach II. As stated previously, the peer teaching for approach III learning opportunities was increased, the peer teaching was patient tailored and a diary was introduced. This redesigned peer teaching took 30 min.

Three classes of young adults from different school sections with no relation to dentistry (total 44, 3 exclusions, mean age 19.9 ± 2.5) were invited to participate. One of the three classes was mainly male. Approach III was delivered by the dentist and dental assistant trainees who had already delivered approach II.

The delivery of the introduction and instruction of approach III took 60 min.

Interim analysis after 1 week revealed a twofold increase in reported adherence in approach III compared with approaches I and II. Therefore, follow-up for approach III was extended to 9 months. Re-evaluation of this group was carried out twice after 3 and 9 months using the same self-administered anonymous quantitative questionnaire. Moreover, diary assessment was added as a new evaluation tool.

Statistical analysis

Statistical analysis was carried out using the SPSS software (SPSS Inc., Chicago, IL, USA). Exact 95% Clopper–Peerson intervals were calculated. The Fisher's exact test was used to test potential differences regarding socio-economic status of participants of approach I–III, to test potential differences regarding adherence of the predominately male class in approach III and the other two female classes in approach III and to establish significance.

Results

General findings

Individual class test analysis after approaches I–III showed that there was no difference concerning factual knowledge attained with approaches I–III. Over 90% of all participants could answer key questions about caries prevention and were able to describe the modified Bass technique correctly.

Participation rates were comparable for each approach. Over 90% of all students participated actively, asked specific questions and could demonstrate the modified bass method correctly.

The questionnaire regarding teaching capacities revealed that in approach I, 96% judged the dentist expert in oral pathology and prevention; in approach II and III, 91 and 93% judged the peers expert.

Self-reported adherence rates

Adherence rates for the first test on the following evening were over 90% for all three approaches.

However, adherence rates after 1 week reported highly significant differences. Reported adherence with approach I was 28.6%, with approach II 39.1% and with approach III 95.1% (see Table 2). Therefore, follow-up of approach III was prolonged. For this prolonged follow-up, participants completed two additional questionnaires after 3 and 9 months. Adherence after 3 months was 75.6 and 68% after 9 months (see Table 2).

Course participation and adherence rates of the two participating female classes and the class with predominately males were compared statistically, and no difference in course participation or in adherence rates was found.

About 50% of the diaries were returned fully completed. Return rates for male and female classes were comparable. Comments indicated full mastery of the modified Bass technique after 1 week.

Discussion

Instruction time of each approach was 1 h and resulted in all three approaches in over 90% adherence the following evening. However, after 1 week, we found a highly significant

Table 2. **Self-reported adherence rates regarding adoption of the modified Bass method in approaches I–III**

	I – Dentist-centred (95% confidence interval)	II – Peer-teaching approach (95% confidence interval)	III – Cooperative approach (95% confidence interval)
Singular (first) try	45/49 91.8% (80.4; 97.7)	45/46 97.8% (88.5; 99.9)	40/41 97.6% (87.1; 99.9)
Continuation (1 week)	14/49 28.6% (16.6; 43.3)	18/46 39.1% (25.1; 54.6)	39/41 95.1%* (83.5; 99.4)
Continuation (3 months)			31/41 75.6%* (59.7; 87.6)
Continuation (9 months)			28/41 68%** (51.9; 81.9)

Exact 95% Clopper–Peerson intervals were calculated, and significance was established with Fisher's exact test.
*$P \leq 0.001$ compared with approach I and approach II.
**$P \leq 0.01$ compared with approach I.

difference: after 1 week, adherence in approach I was only 28.6, 39% in approach II and 95% in approach III, and this important difference in adherence even persists after 3 (76%) and 9 months (68%).

How can we explain this huge difference in adherence?

Because of the different protocols of approach I–III, the planning and preparation of each instruction was different; especially working with the adherence triangle in approach III was more time consuming. However, once the (peer) teachers were prepared in all three approaches, they had only 60 min to deliver their instruction, which resulted in significant differences in adherence. In view of the results of the teaching capacity and the fact that the dentist had the highest rating, differences in teaching quality cannot be the explication.

We believe that two points are most important:

Firstly, we could integrate several previously described concepts in approach III. Concepts were behavioural techniques (16, 17), patient tailoring, (13–15) integration of educational tools and medical correctness (18–20), which will be detailed later.

Secondly, the *adherence triangle* technique made dentists, adult peers and teachers work together as equal partners. It was this unique collaboration that actually allowed us to amalgamate new ideas and previously described techniques to the new and harmonized approach III. However, we do not want to conceal the fact that the *adherence triangle* was challenging, especially for the dentists, because from a dental point of view, this meant quite often confining dental soundness to the limit of correctness.

Furthermore, we believe that the integration of the following concepts was beneficial:

Preparation to change was initiated by a combination of cognitive and emotional factors that stressed direct consequences of insufficient oral care (7). 'Kissing attractiveness' (7) was treated extensively especially in the motivation film. Apparently, these efforts succeeded by creating a 'vulnerable' state of motivation.

In the 'action' state, the young adults were invited to take over control and to arrange instruction according to their needs, a process which is significantly associated with higher adherence (6, 16–18, 20–22).

After instruction, the second crucial step is maintenance at home. Essential factors could be provided: continuous feedback (16, 17, 22), patient-tailored information sheets (8, 13) and the diary. Diary analysis after 1 week revealed that the diary itself and the information sheet were important for motivation and to check the toothbrushing technique during the first week.

Prolonged evaluation of adherence rates for approach III revealed that reported adherence remained at a high level of 68%. One explanation for this high and sustained rate of adherence up to 9 months may be that compliant participants have established a health habit. Because a habit needs only a minimum level of motivation (22), it seems justified to predict that from 9 months on, adherence rates should remain relatively stable (6, 7, 17, 23).

Study limitations

When it comes to oral health, male patients had been identified by other studies to comply worse than females (15). For this reason, we included males in one class of approach III. Statistic comparison did not reveal any significant gender differences. Therefore, we do not believe that this inclusion of males in one class is a relevant confounding factor. However, this inclusion indicates that approach III also offers some tools to circumvent potential non-adherence of males. An interesting question for further research in this respect will be whether this high compliance of males is associated to the delivery of this course by female dental assistant trainees.

The inclusion of dental assistant trainees in approach I might have biased results. Their professional background might have resulted in a higher rate of reported adherence with approach I. However, adherence with approach I was the lowest of all. We believe that the low rate of adherence rather suggests that dental assistant trainees were not substantially influenced by their profession. This group seems to be representative to a large extent of a generally young adult population.

Another potential bias might be that dental assistant trainees who had delivered approach II also delivered approach III. Therefore, they could have been more experienced then. However, adherence rates after 1 day were similar for approaches II and III as was the participants' appraisal of dental assistant trainees' teaching qualities in approaches II and III.

From a statistic point of view, it would have been wise to follow up approaches I and II for 9 months as well. However, previous studies showed that once the instruction is finished, adherence rates decline, especially during the first 3 months (4, 18). Therefore, it is unlikely that adherence rates of approach I and II, which had dropped considerably in 1 week – I (28.6%) II (39.1%) – would re-increase after time. However, as we do not have data for the adherence rate with approaches I or II after 9 months, no statistical comparison can be made.

Nonetheless, bearing in mind that adherence generally decreases over time (3, 4, 8, 14, 18, 23), it is striking that adherence even after 9 months in approach III (68%) is higher than adherence in approaches I (28.6%) and II (39.1%) after only 1 week.

Previous studies yielded a maximum adherence of 50% and consisted of more than one intervention (3, 4, 14, 18). Our results of 68% adherence after 9 months with only one intervention in approach III seem to be promising. However, we are aware that direct comparison to previous studies should be done cautiously because definitions of adherence may vary.

Only some measurements were entirely objective (supervision by expert personnel during instruction and cognitive testing). Questionnaires tend to overestimate the degree of adherence, but if non-discriminating questions are used for young adults, they still present a reasonable reliability (24). This was supported by the diary, which is itself a valid monitor (19). With all three approaches, it is possible that statements of adherence were biased to please teachers and peers. This might be the case especially with approaches II and III, which used peer teaching. We tried to minimize this bias by only inviting young adults who were completely foreign to dental assistant trainees. Moreover, conditions of approaches II and III were alike. Therefore, a comparison of reported adherence between approaches II and III cannot be affected by this bias. We can assume that the highly significant increase in adherence with approach III compared with approach II is valid, especially in view of the 100% response rate of all questionnaires.

Establishing an *adherence triangle* approach initially is time consuming. Therefore, it is highly advisable to establish a school project and to include several school matters (20, 25). This project-like approach of approach III embraced Science, Mathematics, German and Religion. This design allows to implement the *adherence triangle* without losing education time (20, 25). At this school, the dentists and the teachers were members of the teaching staff, and participation was part of their duty in regard of the introduction of the new curriculum. Moreover, once the material is created, the project can be administered by local staff without exceeding their habitual teaching duty.

This study shows that only adding recent educational techniques to well-known approaches (i.e. approaches I and II) have limited effect. Moreover, we could demonstrate that the *adherence triangle* approach yielded considerably high rates of reported adherence in young adults in a school setting over a period of 9 months. Therefore, it seems to be a valuable new tool for those dentists who engage themselves in oral health programmes in schools. Further research will be necessary to evaluate how the *adherence triangle* approach could be transferred to the setting of the dental cabinet.

Acknowledgments

We are grateful to the participating young adults, the dental assistant trainees, the school administration at Ludwig-Erhard-Berufskolleg and the following people who contributed substantially to the conduct of the study: Dr Regine Schewe and the dental assistants of the Arbeitskreis Jugendzahnpflege der Bundesstadt Bonn, Dr Wolfgang Micheelis Institute of German Dentists and Herbert Stecher at the Centre of dental medicine University of Cologne.

The study was supported by the dental service for schools in the city of Bonn (Arbeitskreis Jugendzahnpflege der Bundesstadt Bonn). Dr Reinhardt was supported by the Braun Oral-B Prize.

References

1 Ashley P. Toothbrushing: why, When and How. *Dent Update* 2001; **28:** 36–40.
2 Van der Wijden GA, Hioe KPK. A systematic review of the efficitveness of self-performed mechanical plaque removal in adults with gingivitis using a manual toothbrush. *J Clin Periodontol* 2005; **32(Suppl 6):** 214–228.
3 Kay E, Locker D. A systematic review of the effectiveness of health promotion aimed at improving oral health. *Community Dent Health* 1998; **15:** 132–144.
4 Watt RG, Harnett R, Daly B *et al*. Evaluating oral health promotion: need for quality outcome measures. *Community Dent Oral Epidemiol* 2006; **34:** 11–17.
5 Cleemput I, Kesteloot K. Economic implications of non-compliance in health care. *Lancet* 2002; **22:** 2129–2130.
6 Hancock EB, Newell DH. Preventive strategies and supportive treatment. *Periodontology* 2001; **25:** 59–76.
7 Macgregor ID, Balding JW, Regis D. Motivation for dental hygiene in adolescents. *Int J Paediatr Dent* 1997; **7:** 235–241.
8 Redmond CA, Hamilton FA, Kay EJ, Worthington HV, Blinkhorn AS. An investigation into the value and relevance of oral health promotion leaflets for young adolescents. *Int Dent J* 2001; **51:** 164–168.
9 Bortz J, Lienert G. *Kurzgefasste Statistik für die klinische Forschung*. Berlin: Springer, 2003, pp. 51–56.
10 Sejr JS, Osler M. Do smoking and health education influence student nurses' knowledge, attitudes and professional behaviour? *Prev Med* 2002; **34:** 260–265.
11 Petty G. *Teaching Today*. Cheltenham: Nelson Thornes, 2004, pp. 462–465.
12 Cohen EG. *Designing Groupwork. Strategies for the Heterogeneous Classroom Teachers*. New York: College Press, 1994, pp. 39–57 and 135–145.

13 Renz A, Ide M, Robinson PG, Smith D. Psychological interventions to improve adherence to oral hygiene instructions in adults with periodontal diseases. *Cochrane Database Syst Rev* 2007; **April 18:** CD005097.

14 Jönsson B, Ohrn K, Oscarson N, Lindberg P. The effectiveness of an individually tailored oral health educational programme on oral hygiene behaviour in patients with periodontal disease: a blinded randomized-controlled clinical trial (one-year follow-up). *J Clin Periodontol* 2009; **36:** 1025–1034.

15 Jönsson B, Ohrn K, Oscarson N, Lindberg P. An individually tailored treatment programme for improved oral hygiene: introduction of a new course of action in health education for patients with periodontitis. *Int J Dent Hyg* 2009; **7:** 166–175.

16 Schou L. The relevance of behavioral sciences in dental practice. *Int Dent J* 2000; **50:** 324–332.

17 Brown LF. Research in dental health education and health promotion: a review of the literature. *Health Educ Q* 1994; **21:** 83–102.

18 Hugoson A, Lundgren D, Asklöw B, Borgklint G. Effect of three different dental health preventive programmes on young adult individuals: a randomized, blinded, parallel group, controlled evaluation of oral hygiene behaviour on plaque and gingivitis. *J Clin Periodontol* 2007; **34:** 307–315.

19 Philippot P, Lenoir N, D'Hoore W, Bercy P. Improving patients' compliance with the treatment of periodontitis: a controlled study of behavioural intervention. *J Clin Periodontol* 2005; **32:** 653–658.

20 Reinhardt CH, Noack MJ, Wassmer G, Hurrelmann K, Klein K. A strategy for encouraging young adults' adoption of a preferred oral hygiene technique. *Oral Health Prev Dent* 2010; **8:** 3–8.

21 Honkala S, Honkala E, Al-Sahli N. Do life- or school-satisfaction and self-esteem indicators explain the oral hygiene habits of schoolchildren? *Community Dent Oral Epidemiol* 2007; **35:** 337–347.

22 Weinstein P, Harrison R, Benton T. Motivating parents to prevent caries in their young children. *J Am Dent Assoc* 2004; **135:** 731–737.

23 Astrøm AC, Jakobsen R. Stability of dental health behavior: a 3-year prospective cohort study of 15-, 16- and 18-year-old Norwegian adolescents. *Community Dent Oral Epidemiol* 1998; **26:** 129–138.

24 Santelli J, Klein J, Graff C, Elster A. Reliability in adolescent reporting of clinician counseling, health care use, and health behaviors. *Med Care* 2002; **40:** 26–37.

25 Reinhardt CH, Löpker N, Noack MJ, Rosen E, Klein K. Peer teaching pilot programme for caries prevention in underprivileged and migrant populations. *Int J Paediatr Dent* 2009; **19:** 354–359.