

# Annual Clinical Journal of

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# DENTAL HEALTH

Evaluating a one hour resiliency workshop delivered to Dental Hygiene and Dental Therapy students: A pilot study

A direct comparison of two interdental cleaning devices on clinical signs of inflammation: A four-week randomised controlled trial

Working with patients and the public to develop dementia friendly oral health tools

Kidsfabriek: Oral health awareness and promotion of oral self-care during a learning and play event for children and parents in The Netherlands

Public awareness and knowledge of the oral health therapy profession in Singapore

Does glycine powder impact on clinical attachment levels and subgingival biofilm in adults with periodontal disease? A systematic review summary

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# Editorial

## A global perspective

Welcome to the 2018 issue of *The Annual Clinical Journal of Dental Health*. I hope you will enjoy reading it and find the content relevant to your daily clinical practise.

There is an international flavour to the journal this year with papers coming from colleagues working in the USA, Singapore and The Netherlands, as well as from the UK. I personally always find it interesting to read about what our peers are experiencing in other countries since we often face similar issues.

The students in Singapore discovered that, among the section of the public they interviewed, there was little awareness of their role and scope of practice. The fact that Dental Hygienists and Therapists aim to help their patients improve their oral health and prevent disease is not widely known in Singapore. I wonder if this is also true of the British public? How many of our patients are aware of exactly what we can do to help them improve their oral health and prevent disease?

It would appear that as a profession we are still battling for recognition, support, funding or autonomy to deliver the full spectrum of dental healthcare that we have been trained and are competent to do. It is a concern. It is scandalous that in England an increasing number of general anaesthetics are being carried out on children for extraction of teeth due to caries than for any other procedure: a disease that is wholly preventable. Scotland and Wales have in place dedicated targeted preventive programmes to improve children's oral health that are achieving positive results. Fundamental to these is the work of Dental Hygienists and Therapists. In England however it is more problematic since individual local health authorities are responsible for public health programmes and there is currently no coherent national strategy. It seems obvious that something needs to change, and that we have a major role to play.

Dental services must meet the needs of all ages of the population. Many of you already engage in domiciliary visits to care homes for the elderly and I am sure you will be interested to read in this journal about the work done to help the wives of some sufferers of dementia. Can you identify with the authors' findings? Perhaps you could get together with some colleagues and set up your own

study and share your observations with your peers?

At the other end of the age spectrum, we have published a paper reporting on an oral health promotion campaign set up by some Dental Hygienists in the Netherlands at a play event for young children. BSDHT has its own national oral health initiative, First Smiles, which takes place every June. Our members visit schools and nurseries and engage with young children, teaching them about oral health and encouraging them to visit their local dental practice. This is gaining momentum every year and I would suggest collating the data could be an interesting research project for some members to follow up and share with our readers through the pages of this journal.

BSDHT continues to be supportive of its members in becoming proactive in research and the first paper in this journal is written by one of the few UK Dental Hygienists to undertake a PhD. Marina Harris presents the results of a pilot study of coping with stress in a cohort of undergraduate Dental Hygienists and Therapists. Stress seems to be part and parcel of our daily practice life and I look forward to reading the results of her main study.

Of direct practical clinical relevance are the two papers on interdental cleaning and the use of glycine powder in patients suffering from periodontal disease. Preventing and treating periodontal disease comprises a large proportion of our clinical time, so I hope that you find something of relevance in both of these papers.

Each of the six papers presented here is fully referenced so there is much for you to follow up to widen your reading. We have awarded one hour of verifiable CPD to each of these papers to allow you enough time to revisit the paper, answer the questions and self-reflect on what you have learnt. On completion you will receive a certificate detailing the aims and objectives and development outcome, as required by the General Dental Council (GDC). You have until the 31 December 2018 to complete it online at [www.bsdht.org.uk](http://www.bsdht.org.uk).

**Heather Lewis**

Editor



# Guest Editorial

## Better in many ways, not so good in others

Over the last ten years in the United Kingdom (UK), there have been major positive changes for Dental Hygienists (DH). With far greater acceptance of the need for more preventive dentistry and better periodontal care, delivered by a dental team, the role of DH has expanded, as have their numbers. Over the last ten years most DH have qualified with a university degree in dental hygiene and therapy, and independent practice is now possible. One effect of the now not so new Dental Contract for the General Dental Services of the NHS has been that by 2011 in general dental practice, nationally, on average, 85% of the treatment provided by DH was under private contract. It can be said that this has been good for DH but not so good for patients who find it difficult to pay. Dental hygiene and therapy is an expanding profession, between 2007 and 2017 the numbers of singularly qualified DH and Dental Therapists (DHT) have risen by 74% from 3833 to 6685 and the ratio of DHT : dentists has improved from 1:8 to 1:6, which is still behind Denmark, Finland and Sweden, where this ratio is currently better than 1:2 and Canada, and the United States of America where it is almost 1:1.

The European context has been important for dentists but not so much for DH. Because of the ease of establishing practice in another European Union (EU) Member State at present 16% of dentists registered with the General Dental Council (GDC) graduated in an EU Member State other than the UK. However, because the profession of Dental hygiene

is not recognised under EU law, it is not so easy for DH to work in other EU countries and fewer than 1% of those registered with the GDC qualified outside the UK. The European Dental Hygienists' Federation has been lobbying the European Commission to recognise the profession. In the future this may happen but probably not for some time. The fallout from BREXIT is unlikely to make it easier for DH from other countries to work in the UK but could allow for major changes in DH, DHT and dentists' education and training with a common pathway during the first three years of a combined dental health BSc. This would be possible because the EU Training Directives would no longer be binding for the UK.

One aspect in which the UK has lagged behind several EU and North American countries has been the woefully small numbers of DH who have undertaken Masters or Doctorates. In Sweden for example by 2017, 36 DHs out of a total of 4500 had PhDs. The author of this editorial is aware of only three UK DH who have either completed or are about to complete a PhD. The British Society of Dental Hygienists and Therapists has been asked to conduct a survey to establish how many UK DH and DHT either have or are studying for a Doctorate or a Masters degree.

Thus it can be said that in general, the last ten years have been good for UK DH and that there are interesting possibilities for the next ten.

**Prof Kenneth A. Eaton**

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# Evaluating a one hour resiliency workshop delivered to Dental Hygiene and Dental Therapy students: A pilot study

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Key words: stress, meaning, dental hygiene and therapy students

## ABSTRACT

**Aims:** To examine whether the delivery of a short duration workshop to educate Dental Hygiene and Dental Therapy students (DHDTs) on developing a more positive relationship between stress and meaning, with a follow-up online journal workbook, would alter how DHDTs understood stress.

**Subjects and methods:** A questionnaire was distributed to Years 1, 2 and 3 DHDTs at the University of Portsmouth Dental Academy (UPDA), during spring 2017. Data were collected on students' perception of levels of well-being, mindset, and sense of coherence before, and three weeks after, attending an optional resilience workshop. Statistical analyses were undertaken using SPSS v22™ software. Paired Samples Tests were carried out and the level for a statistically significant difference was set at  $p < 0.05$ .

**Results:** The response rate for participants who had completed both pre- and post-workshop questionnaires, and attended the workshop, was 26% ( $n = 19$ ). There was a significant increase ( $p < 0.05$ ) in reported levels of self-compassion and manageability of situations (coherence) after attending the workshop. All respondents reported a positive shift in their perception of valued living, understanding of self, and stress mindset, but they were not significant.

**Conclusions:** Taking part in a one-hour workshop, and completing a post session workbook, had a positive effect in the way DHDTs understood stress, and shows promising results of the positive impact that such workshops could have on the resiliency and well-being of students in the dental undergraduate training environment.

## Introduction

Over the last three decades, the literature exploring stress and well-being in the dental undergraduate environment has focused on the negative aspects of stress, with researchers often advocating curriculum change to reduce the sources of stress in the dental undergraduate programme.<sup>1-4</sup> However, despite the plethora of studies<sup>5-8</sup> which have examined the sources of stress in dental students (DS), little has been done to reduce stress as part of the curriculum in dental programmes. Indeed, a recent systematic review which examined stress management in DS, identified a total of seven studies which met the criteria of the review.<sup>9</sup> In this review, Alzahem *et al* (2014) found that most of the participants liked the interventional programme, and they found it useful, yet only four studies were able to show any significant stress reduction. However, the underlying

assumption in this research was that stress is always negative and must be reduced.<sup>9,10</sup>

The negative view of stress, and the recommendations to reduce the amount of stress in dental undergraduate training, is in contrast with the latest research which views stress through a more optimistic lens.<sup>11,12</sup> A recent study<sup>11</sup> suggested that a stressful life can also be a meaningful life where the stress of pursuing goals feeds a sense of purpose. Linked to this, the study further suggested that individuals often will accept short-term costs, for example pain, anxiety and stress, in order to come out better in the long run. Subsequent research<sup>12</sup> further supported this, and concluded that stress should not be seen purely as a problem to be eliminated, but as a sign that something you care about is at stake.

Two recent studies in the field of dental undergraduate education to adopt such a positive approach, examined stress and well-being among

dental hygiene and dental therapy students (DHDTS) in one centre in the United Kingdom (UK).<sup>13,14</sup> These studies showed that DHDTS' perceived sources of stress within their undergraduate programme were comparable to reported findings amongst DS.<sup>1-8</sup> However, the DHDTS, unlike the dental students, also reported high scores in psychological wellbeing dimensions, specifically in: goals, purpose in life, personal growth, and living a valued life.<sup>15-19</sup> One of these studies<sup>8</sup> also found that participants' perceived sources of stress in their undergraduate programme were very strongly linked to meaningfulness. For example, the majority of the participants derived a sense of fulfilment from aspects of their undergraduate programme which they perceived as stressful. However the participants still perceived stress as detrimental to their academic performance, and also tended to lack self-compassion in instances where they under-performed. The researchers concluded that rather than introducing curriculum change to reduce stress, as advocated in the previous literature, interventions to raise awareness of the meaningful relationship of stress as a coping mechanism to build resiliency should be implemented.<sup>8</sup>

Other studies have shown the positive effect of interventions which raise conscious awareness of the nature of stress.<sup>20-22</sup> In one study, Crum *et al* (2013) delivered a two hour mindset training programme designed to help participants adopt a mindset which perceived stress as enhancing, rather than stress as a debilitating mindset.<sup>22</sup> As a result of this short intervention, participants adopted more of a *stress is enhancing* mindset about stress, which in turn, produced positive significant changes in their health and performance. Other researchers (Ellis, 2001; Neff, 2011) have described the importance of educating individuals to accept that self-worth should not be contingent on performance.<sup>23,24</sup> Moreover, that striving to be a perfectionist or having irrational beliefs that one must not fail at goals, can be detrimental to mental health well-being. Neff (2011) has shown that completing reflective writing exercises in a journal workbook, can increase participants' ability to have more self-kindness, common humanity, and mindfulness (which are the three components of self compassion).<sup>24</sup>

Accordingly, the aim of this study was to examine whether the delivery of a short duration workshop to educate DHDTS on the meaningful relationship of stress, with a follow-up online journal workbook, would alter how DHDTS understood stress.

## Subjects and methods

Ethical approval was gained from the University of Portsmouth Research Ethics Committee (SFEC 2017 – 019). An anonymous, self-reported online questionnaire was administered to 72 DHDTS (Years 1, 2 & 3) of the BSc (Hons.) in Dental Hygiene and Therapy, at the University of Portsmouth Dental Academy (UPDA), in March 2017, approximately one week prior to the delivery of a stress-resilience workshop. The delivery of the workshop was deliberately timed to provide the opportunity for DHDTS to gain benefit from positive shift changes in their understanding of stress, in the weeks immediately prior to undertaking the end of year assessments.

A follow-up of the same questionnaire was then administered three weeks following the workshop. Completion of the survey was taken as consent to participate in the survey. A few days prior to the launch of the first survey, the researcher gave a verbal briefing to the students about the nature of the study, which was to use pre- and post-workshop questionnaires to evaluate the psychological impact of a voluntarily attended stress resilience workshop. It was made explicitly clear that students had the freedom of choice to participate in all parts of the study (e.g. complete pre- and post-workshop surveys, and attend workshop), or only some parts of the study if they wished (e.g. attend workshop

only), or not participate in the study at all. However, it was also made clear that only data obtained from students who participated in all parts of the study would be classed as useable data for the aim of the research. To identify participants who had completed all aspects of the study, respondents were asked to provide a unique identity code in the pre- and post-workshop survey, and to have answered 'yes' to the question "did you attend the workshop" on the post-workshop survey.

The purpose of the one-hour workshop was to provide participants with information about the nature of stress and well-being, and raise awareness of the meaningful relationship of stress as a coping mechanism to build resiliency. More specifically, the workshop included the following content: rational emotional behavioural theory (information on the nature of unconditional self-acceptance, even when one under performs); the paradox of stress (information on the debilitating nature of stress, but also emerging evidence of the enhancing nature of stress); sense of coherence (information on orientation toward one's world that sees stimuli as meaningful, comprehensive, and manageable, to guide behaviour that is more likely to resolve the problems posed by stressors); and values and goals (information on understanding how aligning values and goals give a sense of meaning, even under stressful circumstances). At the end of the workshop, participants were advised that they would be emailed a link to a brief, online workbook on the topic of self-compassion, and a link to the Values in Action Inventory of Strength (VIA-IS) questionnaire. The VIA-IS is a tool by which people can identify their own positive strengths and learn how to capitalise on them. Completing the online workbook and VIA-IS was optional. Email prompts to participate in these online activities were sent out at intervals of one, two, and three weeks following the workshop. To fit in with the timetabled curriculum, the same one-hour workshop was delivered separately to Year 1, 2, and 3 students.

Qualtrics™ software used for the survey captured the students' year of study and age. Gender was not captured, as this would identify the very small number of male DHDTS. The survey consisted of five instruments to measure the way individuals see themselves, and included the: Valuing Questionnaire (VQ); Stress Mindset Measure (SMM); Self-Compassion Scale (SC); Sense of Coherence Scale (SOC-29); and the Understanding Self Scale (USS).

The VQ,<sup>16</sup> a self-reporting ten item scale, was selected to measure the extent to which DHDTS lived out their values across their life. The VQ was used to measure how much participants were living according to their personal values, rather than what their values were *per se*. This instrument was originally designed to track clients' progress towards living according to their values in Acceptance and Commitment Therapy (ACT),<sup>17</sup> but it is not client specific so can be used with the general population. Participants responded using a six-point format ranging from 0 = not at all true, through to 6 = completely true. The 10-item scale has two subscales: five items totalled which measure progress towards valued living and five items which measure obstruction towards valued living. Subscale scores were calculated by summing the scores of the five items in each sub-scale to get a score for the progress domain and a score for the obstruction domain.

The SMM,<sup>22</sup> a self-reporting eight item scale was used to measure the extent to which the DHDTS adopted one of two mindsets; that the effects of stress were either enhancing or debilitating. Participants responded using a five-point scale ranging from 1 = strongly disagree to 5 = strongly agree. Scores were calculated by summing the scores of the eight items to get a total SMM score. Higher scores on the SMM represent the mindset that stress is enhancing.

The SC,<sup>24,25</sup> a self-reporting 26-item scale, was adopted to measure the extent to which the DHDTS typically acted towards themselves in difficult

times. Participants responded using a five-point scale ranging from 1 = almost never to 5 = almost always. Scores were calculated by summing the scores of the 26 items to get a total score for self-compassion.

The SOC-29,<sup>26</sup> a self-reporting 29-item scale was selected to measure how DHDTS understood the overall meaning and coherence of their lives. Participants responded to each individual item using a seven-point scale ranging from 1 to 7, which corresponded to opposite ends of the spectrum for a response to the item statement (e.g. 1 = never have this feeling to 7 = always have this feeling; 1 = full of interest to 7 = completely routine). The 29-item scale has three subscales: 11 items which measure comprehensibility (understanding what happens around you), 10 items which measure manageability (the extent that one is able to manage the situation), and 8 items which measures meaning (ability to find meaning in a situation). Subscales were calculated by summing the scores of the items in each sub-scale to get a score for comprehensibility, manageability, and meaning.

The USS, a self-reporting 16-item scale, designed by the authors of this study, was used to measure how DHDTS understood, and reflected on, their sense of self. For example, “my self-worth is affected by how well I do when I am competing with others” and “if people make comments about what I have done, I thank them and do not take it personally”, are two of a number of scale items to measure an individual’s perception of self-worth. Participants responded using a seven-point scale ranging from 1 = not at all true to 7 = completely true. Scores were calculated by summing the scores of the 16 items to get a total understanding self-score.

Statistical analysis carried out using SPSS v22™ included frequency distributions, reliability analysis, and correlation analysis. The data were checked for normality, kurtosis and skew. Paired Samples Tests were carried out, and the level for a statistically significant difference was set at  $p < 0.05$ .

## Results

Cronbach’s alpha ranged from .7 to .88 for all of the scales. The reliability of all the scales was within the acceptable limits. The response rate for the pre- and post-workshop survey was 72% (n=52) and 43% (n=31) respectively. The response rate for participants who had completed both pre- and post-workshop questionnaires and attended the workshop was 26% (n=19). The mean age for DHDTS was 27 years, with a range of 20 to 48 years. Participants in this group were from Years 1 (n=5), 2 (n=8), and 3 (n=6), and thus a good representative sample of the total UPDA student population.

SC, VQ, SMM and USS (max score within each scale)	Pre w’shop (n = 19) Mean (SD)	Post w’shop (n = 19) Mean (SD)	p value
Self-Compassion (130)	74.56 (16.64)	83.0 (12.92)	0.006*
VQ Progress (30)	19.88 (6.47)	19.38 (5.96)	0.74
VQ Obstruction (30)	13.68 (7.89)	10.84 (4.56)	0.23
SMM (40)	13.73 (6.29)	14.21 (5.87)	0.77
USS (112)	67.26 (11.88)	70.33 (11.07)	0.16

\*  $p < 0.05$

Table 1. Pre and post-workshop mean scores of SC, VQ, SMM and USS

Table 1 compares DHDTS’ pre- and post-workshop mean scores for SC, VQ, SMM, and USS. There was a significant difference in the SC pre- and post-workshop scores ( $p < 0.05$ ), with participants reporting to have much higher self-compassion after attendance at the workshop

than before attending. Scores for progress towards values did not alter after attendance at the workshop; however post-workshop scores for obstruction to values were lower. Participants reported a very low stress (that is debilitating) mindset both pre- and post-workshop, albeit slightly higher (that is moving towards a more enhancing mindset) after attending the workshop, and a noticeable increase in their post-workshop scores of understanding self. There were no statistically significant differences between the pre- and post-workshop scores.

SOC-29 subscale (max score within each subscale)	Pre w’shop (n = 19)	Post w’shop (n = 19)	p value
Comprehensibility (77)	39.35 (7.81)	43.92 (9.26)	0.054
Manageability (110)	45.0 (10.22)	49.07 (8.87)	0.046*
Meaning (88)	38.26 (8.38)	39.2 (9.09)	0.583

\*  $p < 0.05$

Table 2. Pre and post-workshop mean scores of SOC – 29 subscales

Table 2 shows DHDTS’ reported scores for the SOC-29 subscales of comprehensibility, manageability, and meaning. There was an increase in all post-workshop scores for all three subscales, with a significant difference in the subscale of manageability ( $p < 0.05$ ).

## Discussion

In all but one of the measures, participants reported a positive (albeit nonsignificant) shift in pre- and post-workshop scores. Specifically, taking part in a one-hour workshop on the meaningful relationship of stress and personal resilience, and completion of an optional follow-on workbook and questionnaire, had a positive effect in the way DHDTS understood stress, and significantly improved their scores for self-compassion and manageability of stressful situations.

As presented in Table 1, the participants showed a positive shift in scores for their understanding of self, and a significant ( $p < 0.05$ ) positive shift in scores for self-compassion after attending the workshop. This is an interesting finding, as competition for grades, and fear of being able to catch up if falling behind, have been reported as high sources of stress for many students in dental undergraduate education.<sup>5,7</sup> Moreover, recent qualitative research described how DHDTS felt threatened when others performed better than they did, and that DHDTS were very self-critical about their own performance.<sup>14</sup> The data from this study suggested that through educating DHDTS to understand that failure is part of the shared human experience, and to treat themselves kindly in such circumstances, the participants viewed themselves in a more compassionate way. Furthermore, the literature supports the notion that those individuals who have self-compassion, are more likely to be compassionate towards other people<sup>17,24,25,27</sup>; a quality that is of critical importance to a future clinician. Although some components of the workshop introduced theories of unconditional self-acceptance and self-compassion, it is more likely that the participants’ additional engagement with the follow-on self-compassion workbook (47%; n=9), may have contributed to the significant difference in pre- and post-workshop scores, and as such, future interventions with follow-on workbook activities may be the most effective, and requires further research.

The high pre- and post-workshop scores for progress towards values and the low scores for obstruction to values (Table 1), showed that DHDTS were students who reported to be living according to their values,<sup>16,17</sup> and attending the workshop did not influence the progress towards



values scores. However, we are unsure if completing the VIA-IS (which identifies strengths and values) after the workshop (47%; n=9), may have contributed to the reduction in the post-workshop VQ obstruction mean scores.

DHDTS reported very low levels of stress as enhancing mindset, and high stress as debilitating mindset (Table 1), which is not considered surprising as individuals are typically encouraged to avoid stressful situations whenever possible, or actively control unavoidable or inevitable stress.<sup>22</sup> Although there was a small positive shift, we did not expect any significant increase in SMM scores after the workshop, as the restriction on time for the workshop meant that participants were only given a brief overview of the theory of stress mindset. This is in contrast to other specific stress mindset interventions which have provided in-depth theory and activities on changing implicit beliefs about stress; reappraisal of stress; and the ability to handle stress,<sup>22</sup> which have taken at least two hours to deliver.

Timetable constraints restricted the workshop to a one-hour intervention, which is shorter than the researchers would have liked. Nevertheless, the overall content of the workshop appeared to have a positive influence to the way DHDTS reported to manage stressful situations and stay well (Table 2). The hallmark of a strong sense of coherence, is the ability to choose what seems to be the most appropriate strategy from among the variety of potential resources for a given situation, usually by understanding yourself and what you need from that situation.<sup>28</sup> Participants in this study reported a noticeable increase in trend for scores which measured their ability to understand what happened around them, and a significant increase ( $p < 0.05$ ) in scores that measured the extent to which they were able to manage a challenging situation on their own, or through significant others in their social network, which according to the literature, is an advantage in preventing tension from being transformed into stress.<sup>26</sup>

Although this study supports the potential effectiveness of this intervention, it does need improvement. The number of DHDTS who participated in this study was small. Increasing the availability for students to participate in such opportunities is thus essential if we are to learn more about the positive trends shown in this small study. Likewise, timetabling this type of intervention, as a routine part of all learner programmes, may be an effective way forward, as would allowing for annual follow-ups to measure the longer term impact of any effects.

## Conclusions

This is the first study to evaluate the effectiveness of a stress and self-compassion intervention, consisting of a one-hour workshop, with an optional follow-up self-compassion workbook to DHDTS. It showed positive psychological changes in the way the students understood stress. Within the limitations of the study, it shows promising results of the positive impact that such workshops could have on the stress and well-being of students in the dental undergraduate training environment. Accordingly, further research to explore the limitations described above, is needed to learn more about the value of these types of positive stress interventions within dental professional training.

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# A direct comparison of two interdental cleaning devices on clinical signs of inflammation: a four-week randomised controlled trial

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Key words: water flosser, air floss, inflammation, Waterpik, Sonicare, plaque, gingivitis

## ABSTRACT

**Objective:** To compare the effectiveness of the water flosser to the air floss pro in reducing clinical signs of inflammation.

**Method:** Seventy subjects were randomised equally into two groups in this examiner-masked, parallel clinical trial: manual toothbrush and water flosser (WF) or manual toothbrush and air floss pro (AFP). Clinical signs of inflammation were measured by bleeding on probing (BOP) and the Modified Gingival Index (MGI) at baseline, 2-weeks and 4-weeks. Plaque was measured using the Rustogi Modified Navy Plaque Index (RMNPI) at baseline, 2-weeks and 4-weeks. A one-way analysis of variance was used for changes in mean scores between treatment groups.

**Results:** Seventy subjects completed the study. Both groups showed a significant reduction in BOP, MGI and RMNPI at 2- and 4-weeks ( $p < 0.001$ ). The WF group was 57% ( $p < 0.001$ ) more effective than the AFP group at reducing BOP, 60% ( $p < 0.001$ ) at reducing MGI, and 31% ( $p = 0.008$ ) for reducing plaque scores at 4-weeks.

**Conclusion:** This study demonstrates that the water flosser and manual toothbrush were significantly more effective than the air floss pro and manual toothbrush in the reduction of clinical signs of inflammation and plaque.

## Introduction

Toothbrushes are primarily designed to remove plaque from the surfaces of the teeth visible in the oral cavity.<sup>1</sup> However, they are limited in their ability to reach interdentally and subgingivally where periodontal disease primarily starts.<sup>2</sup> Thus another device is needed to complement the toothbrush that is designed to clean the interdental area and proximal surface of the teeth.

For decades, brushing and flossing was the standard of care and recommended for all patients as the first line of defence in preventing gingivitis. Dental professionals have known for years that patients do not like to floss, do not feel comfortable with their abilities, or simply lie about their behaviour, even though it is obvious by the condition of their oral health.<sup>3,4</sup> If given a choice, patients will readily choose other devices over dental floss.<sup>5</sup>

Dental professionals want to recommend devices that are effective, easy to use, and foster adherence to oral care recommendations. Dental floss is no longer the standard of care for interdental cleaning based on clinical evidence. Systematic reviews have shown a lack of quality research on the effectiveness of dental floss and surveys have demonstrated that many people do not comply.<sup>6,7,8</sup> A 2008 systematic review found that the majority of the 11 studies included did not show a benefit for brushing and flossing on plaque and clinical parameters of gingivitis, compared to brushing alone.<sup>6</sup> This led the researchers to conclude there is a lack of evidence to support the routine recommendation of floss for interdental cleaning. Subsequently, a 2012 systematic review included 12 studies and reported there was some weak and unreliable evidence that adding tooth brushing to dental flossing, compared to brushing alone, reduced gingivitis and had better plaque reductions.<sup>7</sup>

A water flosser (WF) has been compared to dental floss in several clinical trials. Barnes *et al.* (2005) found a manual toothbrush and a WF had a 50% greater reduction in gingivitis compared to a manual brush and dental floss.<sup>9</sup> Rosema *et al.* (2011), reported twice the reduction in bleeding for the WF compared to dental floss in two weeks.<sup>10</sup> Notably, the WF continued to show improvements at four weeks but the dental floss reverted back to baseline scores. Magnuson *et al.* (2013) demonstrated a 145% better reduction in bleeding around implants with a WF compared to dental floss and Sharma *et al.* (2008) reported a 26% better reduction for adolescents in fixed orthodontic appliances.<sup>11, 12</sup>

An air floss device has also been compared to dental floss. As reported in a poster presentation in 2016, a 28-day study showed there were no differences between the air floss pro used with an antimicrobial (Listerine® or BreathRx®) and dental floss in plaque accumulation, gingival bleeding or gingivitis when paired with a manual toothbrush.<sup>13</sup> A single-use study poster presentation (2015) showed no differences in plaque removal between the air floss pro with water or Listerine® antiseptic, compared to dental floss when paired with a manual toothbrush.<sup>14</sup> To date, there are no studies published in peer-reviewed journals on the Sonicare® Air Floss or Air Floss Pro.

This study was designed to compare the effectiveness of the Waterpik® Water Flosser to the Sonicare® Air Floss Pro on reducing clinical signs of inflammation.

## Methods and materials

### Subjects

Seventy healthy, non-smoking subjects were enrolled in this study who met the inclusion and exclusion criteria (Table 1). Both male and female subjects were enrolled with no consideration of race or ethnicity. Study demographics are shown in Table 2. The study and documents were approved by All Sum Institutional Review Board (ASIRB). All subjects read and signed a consent form and completed a medical history.

### Study devices

This study compared two electric interdental cleaning devices that are currently on the market. The Waterpik® Water Flosser (WF; model WP-120, two pin plug; Waterpik International Inc., Reigate, Surrey, UK) is a power driven device that produces a pulsating stream of water under pressure. The tip is directed at the gingival margin and interdental areas and the pulsating water produces a compression and decompression phase at the gingival margin, which allows for expeditious removal of dental bacteria and debris interdentally and subgingivally (Figure 1). The water or other solution is placed in a reservoir calibrated with both millilitres (ml) and ounces. In this study the subjects in Group 1 used warm water and the Classic jet tip (Figure 2). The subjects used manufacturer’s instruction following a pattern around the mouth with the pressure setting on medium-high (setting #8) and the reservoir filled with 500 ml of warm water.

Group 2 was provided the Sonicare® Air Floss Pro (AFP; model HX8340, two pin plug; Royal Philips, Amsterdam, NL). The AFP is a hand-held device that utilises air under pressure targeting the interproximal area (Figure 3). The device can be set on either 1, 2 or 3 puffs of air. There is a small reservoir that holds enough water or

other agent for one or two uses and provides micro droplets with the puff(s) of air when the activation button is pressed. In this study, the subjects used warm water in the reservoir and set the handle on 3, providing three consecutive puffs of air with one activation. The subjects used manufacturer’s instructions for usage of the device.

Inclusion	
• Between 25 and 75 years of age	
• Able to provide written informed consent prior to participation	
• Agree to not participate in any other oral/dental products clinical study for the study duration	
• In good general health	
• Non-smoker	
• Have 50% bleeding on probing sites	
• Have no probing depths greater than 5 mm	
• Have a minimum of 20 scoreable teeth (not including 3rd molars)	
• No partial dentures, orthodontic brackets, wires or other appliances	
• Agree to refrain from the use of any non-study dental device or oral care product for the study duration	
• Agree to return for the scheduled visits and follow study protocol	
• Agree to delay dental prophylaxis until study completion	
• Have a minimum pre-brushing plaque score of 0.6	
• Have a minimum of 1.75 gingivitis score	
Exclusion	
• Have probing depth greater than 5 mm	
• Have a systemic or autoimmune disease (ex. Diabetes, Sjogren’s syndrome)	
• Have advanced periodontitis	
• Taking medication that can influence gingival health (ex. Dialantin, calcium channel blockers, Cyclosporine, anticoagulants)	
• Have orthodontic appliances or removable partial dentures	
• Pregnant at time of study	
• Use of antibiotics within 6 months of study	

Table 1: Inclusion and Exclusion Criteria

	Group 1: WF (N=35)	Group 2: AFP (N=35)	Overall (N=70)	p-value**
Age (years)				0.4540
N	35	35	70	
Mean	46.9	50.0	48.4	
Standard Deviation	9.89	7.27	8.75	
Standard Error	1.67	1.23	1.05	
Minimum	25.0	33.0	25.0	
Maximum	64.0	64.0	64.0	
Gender				0.7280
Male	11 (31.4%)	8 (22.9%)	19 (27.1%)	
Female	24 (68.6%)	27 (77.1%)	51 (72.9%)	
Smoke				
No	35 (100.0%)	35 (100.0%)	70 (100.0%)	

\* P-values: Age = Wilcoxon rank-sum, Gender = Fisher’s Exact Test

Table 2: Subject Demographic Data



Figure 1: Waterpik® Water Flosser (WP-120)



Figure 2: Classic Jet Tip placed at the interproximal space



Figure 3: Sonicare Air Floss Pro (HX8340)

## Study design

This is a single centre, examiner masked, parallel, randomised controlled trial. A computer-generated randomisation schedule was prepared by the study statistician. Based on the randomisation schedule, patients were randomly assigned in a 1:1 ratio to one of the two treatment groups.

Subjects in both groups received a standard manual toothbrush (Oral-B® Indicator 35, Procter & Gamble, Cincinnati, OH, USA) and Crest® Cavity Protection Toothpaste, regular mint flavour (Procter & Gamble, Cincinnati, OH, USA). Data were recorded at baseline (BSL), two weeks (W2), and four weeks (W4) for the three clinical parameters: Bleeding on Probing (BOP), Modified Gingival Index (MGI)<sup>15</sup>, and Rustogi Modification of the Navy Plaque Index (RMNPI).<sup>16</sup> Oral examination of hard and soft tissue was assessed at all visits and recorded.

Subjects abstained from all oral hygiene methods for 12 – 14 hours prior to all appointments scheduled. One examiner scored all data at

all visits and was masked to group allocation. The primary objective was to determine the effectiveness of a WF in reducing clinical signs of inflammation as compared to the AFP at W4. The secondary objective was to determine the effectiveness of a WF in reducing plaque as compared to the AFP at W4.

Inflammation was assessed by BOP and MGI. Bleeding was scored at six sites per tooth on a binary scale as either positive (1) or negative (0). MGI was scored on all teeth on the facial and lingual sides of the tooth and scored using a 0 – 4 scale (Figure 4).

### Modified Gingival Index

- 0 = Absence of inflammation
- 1 = Mild inflammation; slight change in colour; little change in texture of any portion of but not the entire marginal or papillary gingival unit
- 2 = Mild inflammation; criteria as above but involving the entire marginal or papillary unit
- 3 = Moderate inflammation; glazing, redness, oedema, and/or hypertrophy of the marginal or papillary gingival unit
- 4 = Severe inflammation; marked redness, oedema, and/or hypertrophy of the marginal or papillary gingival unit, spontaneous bleeding, congestion, or ulceration.

Figure 4

Subjects first swished with 2.5 ml erythrosine (FD&C #3) disclosing solution (Germiphene Corporation, Brantford, ON, Canada) for 15 seconds followed by rinsing with 10 ml water for 10 seconds, and then expectorated. Plaque was assessed using the RMNPI. The tooth surface ( facial/lingual ) was divided into 9 segments (Figure 5).

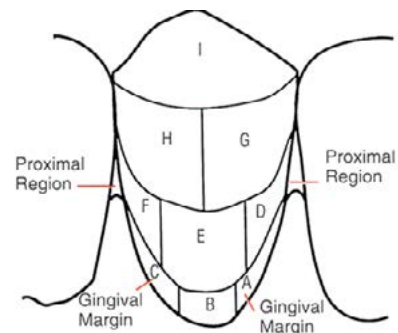


Figure 5: Rustogi Modification of the Navy Plaque Index. Plaque is assessed for each tooth area (A through I) and is scored using the following scale: 0 – absent, and 1 = present. Facial and lingual surfaces of all gradable teeth are scored and a mean plaque index (MPI) is calculated for each subject at each examination. Subjects' scores were calculated for whole mouth (areas A through I), along the gingival margin (areas A through C), and proximal (approximal) (areas D and F).

All subjects brushed their teeth as they normally do once in the morning and once in the evening. They used their interdental device once a day in the evening following tooth brushing. Verbal and written instructions for the WF or the AFP were provided to the subjects appropriate to their allocation.

## Statistical analysis

The primary outcome was the reduction in the percentage of sites with bleeding on probing (BOP) after four weeks. The initial

Group 1 (WF)	BOP Mean	SD	MGI Mean	SD	RMNPI Mean	SD
Baseline (Whole Mouth)	0.55	0.043	2.15	0.114	0.64	0.036
2 weeks	0.31	0.075	1.86	0.177	0.53	0.062
4 weeks	0.13	0.064	1.68	0.196	0.47	0.081
Baseline (Proximal)	0.65	0.044	2.16	0.122	1.00	0.000
2 weeks	0.36	0.093	1.9	0.177	0.79	0.149
4 weeks	0.16	0.081	1.75	0.199	0.63	0.239
Baseline (Marginal)	0.34	0.078	2.13	0.104	1.00	0.000
2 weeks	0.2	0.07	1.77	0.185	0.97	0.028
4 weeks	0.08	0.042	1.53	0.205	0.95	0.039
Baseline (Proximal Facial)	0.59	0.094	2.07	0.103		
2 weeks	0.26	0.117	1.83	0.178		
4 weeks	0.07	0.097	1.66	0.211		
Baseline (Proximal Lingual)	0.71	0.115	2.25	0.163		
2 weeks	0.45	0.124	1.97	0.221		
4 weeks	0.24	0.103	1.85	0.216		
Baseline (Marginal Facial)	0.28	0.071	2.03	0.089		
2 weeks	0.12	0.071	1.67	0.199		
4 weeks	0.02	0.04	1.39	0.231		
Baseline (Marginal Lingual)	0.4	0.117	2.22	0.142		
2 weeks	0.28	0.119	1.87	0.229		
4 weeks	0.13	0.067	1.67	0.22		
Baseline (Facial)					0.64	0.060
2 weeks					0.51	0.075
4 weeks					0.45	0.093
Baseline (Lingual)					0.64	0.034
2 weeks					0.55	0.069
4 weeks					0.5	0.083

Group 2 (AFP)	BOP Mean	SD	MGI Mean	SD	RMNPI Mean	SD
Baseline (Whole Mouth)	0.55	0.041	2.13	0.098	0.63	0.023
2 weeks	0.4	0.06	1.96	0.143	0.56	0.060
4 weeks	0.28	0.049	1.84	0.155	0.51	0.058
Baseline (Proximal)	0.66	0.045	2.15	0.111	1.00	0.000
2 weeks	0.48	0.078	2.01	0.155	0.88	0.115
4 weeks	0.34	0.062	1.91	0.152	0.75	0.181
Baseline (Marginal)	0.32	0.08	2.09	0.089	1.00	0.000
2 weeks	0.25	0.063	1.86	0.137	0.99	0.016
4 weeks	0.16	0.041	1.70	0.173	0.96	0.081
Baseline (Proximal Facial)	0.65	0.1	2.08	0.107		
2 weeks	0.44	0.101	1.96	0.167		
4 weeks	0.28	0.08	1.86	0.154		
Baseline (Proximal Lingual)	0.67	0.086	2.21	0.159		
2 weeks	0.52	0.101	2.05	0.193		
4 weeks	0.40	0.108	1.95	0.186		
Baseline (Marginal Facial)	0.28	0.096	2.02	0.097		
2 weeks	0.21	0.074	1.8	0.162		
4 weeks	0.11	0.055	1.62	0.201		
Baseline (Marginal Lingual)	0.36	0.109	2.17	0.124		
2 weeks	0.29	0.087	1.93	0.174		
4 weeks	0.22	0.078	1.77	0.189		
Baseline (Facial)					0.63	0.044
2 weeks					0.54	0.079
4 weeks					0.48	0.076
Baseline (Lingual)					0.64	0.032
2 weeks					0.59	0.058
4 weeks					0.54	0.061

Table 3: Overall Means and Standard Deviations of Raw Scores for BOP, MGI, and RMNPI

comparison was the mean change among the two groups, utilising one-way analysis of variance (ANOVA). The arcsine transformation was used to stabilise the variances of the percentage data.<sup>17</sup> The transformed data was used in the analysis; however, tables present the mean of subject-specific percentages for the groups. Data were summarised using descriptive statistics by treatment group and overall. Tables comparing treatment groups provide differences in the least squares mean, the standard deviation of the differences, and the p-value.

The secondary outcomes were to determine the effectiveness of a WF in reducing gingival inflammation and plaque as compared to AFP. Gingival inflammation was measured using the Modified Gingival Index (MGI). Plaque reduction was measured using the Rustogi Modified Navy Plaque Index (RMNPI) at baseline and after two and four weeks.

There were no changes from the planned analysis. The statistical analysis software used was SAS 9.4 for the PC Windows platform.

### Data management

Data were collected on Case Report Forms (CRFs) for each subject and coded to maintain confidentiality. Entries were recorded in black ball-point ink with any transcription or entry errors corrected by the following method; striking a single line through invalid data, initialing, and dating, followed by entry of correct data. CRFs were completed in their entirety and reviewed for completeness and accuracy of all data, then signed by the principle investigator. The CRFs underwent key batch entry and verification. Data were tabulated according to the clinical scoring appropriate for the index used.

### Results

All seventy subjects completed the study. No adverse events were reported by any subjects nor were there any intraoral findings reported on the CRFs by the examiner. Baseline comparability was conducted for all indices. The two treatment groups were comparable at BSL for BOP, MGI, and RMNPI at all endpoints measured (Table 3).

4 Weeks	Whole Mouth	Proximal	Facial Proximal	Lingual Proximal	Marginal	Facial Marginal	Lingual Marginal
WF	76.2%	75.8%	87.9%	65.6%	77.7%	91.2%	68.2%
AFP	48.5%	48.4%	57.2%	39.9%	48.8%	60.6%	39.8%
Difference between groups	57%	57%	54%	64%	59%	50%	72%
p-value	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001

2 weeks	Whole Mouth	Proximal	Facial Proximal	Lingual Proximal	Marginal	Facial Marginal	Lingual Marginal
WF	44.0%	45.0%	56.0%	35.8%	40.3%	56.0%	29.1%
AF	26.1%	26.8%	31.5%	22.3%	23.2%	25.6%	21.4%
Difference between groups	69%	68%	78%	60%	73%	118%	36%
p-value	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001	p=0.028

Table 4: Bleeding on Probing Percent Improvements

4 Weeks	Whole Mouth	Proximal	Facial Proximal	Lingual Proximal	Marginal	Facial Marginal	Lingual Marginal
WF	21.9%	18.8%	19.8%	17.8%	28.2%	31.9%	24.8%
AF	13.7%	11.1%	10.7%	11.6%	19.0%	19.7%	18.3%
Difference between groups	60%	68%	86%	54%	48%	62%	36%
p-value	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001

2 Weeks	Whole Mouth	Proximal	Facial Proximal	Lingual Proximal	Marginal	Facial Marginal	Lingual Marginal
WF	13.5%	11.9%	11.5%	12.3%	16.8%	18.0%	15.8%
AF	8.0%	6.5%	5.8%	7.1%	11.1%	11.1%	11.1%
Differences between groups	54%	65%	98%	38%	40%	62%	19%
p-value	p<0.001	p<0.001	p<0.001	p=0.001	p<0.001	p<0.001	p=0.002

Table 5: Modified Gingival Index Percent Improvements

### *Bleeding on probing*

Both groups showed changes from BSL to W2 and W4 for all BOP endpoints ( $p<0.001$ ). The WF group (group 1) was at least 50% more effective than the AFP group (group 2) for reducing BOP at W4 for all endpoints ( $p<0.001$ ) (Table 4).

### *Gingival index*

Both groups showed significant changes from BSL to W2 and W4 for all MGI endpoints ( $p<0.001$ ). The WF group was 60% more effective than the AFP group for reducing whole mouth MGI. Notably, the WF was 86% more effective for facial proximal area and 54% for lingual proximal area ( $p<0.001$ ) (Table 5).

### *Plaque index*

Both groups showed significant changes from BSL to W2 and W4 for all RMNPI endpoints ( $p<0.001$ ). At W4 the WF group was significantly more effective than the AFP group for whole mouth (31%,  $p=0.008$ ), proximal (51%,  $p=0.017$ ) and lingual (46%,  $p=0.004$ ) endpoints (Table 6).

## Discussion

Self-performed oral hygiene of brushing and string flossing is no longer the standard of care for daily oral hygiene. The consensus report of the 11<sup>th</sup> European workshop on periodontology systematically reviewed the literature on effective prevention of periodontal and peri-implant diseases. Tonetti and colleagues (2015) reported oral health providers need to routinely recommend an effective patient-centred oral hygiene programme including incorporating behaviour change techniques.<sup>18</sup> The oral hygiene programme should be based on careful selection of devices, such as toothbrushes and interdental aids, tailored to the needs and preferences of the patient.

There is a need for information on the clinical effectiveness of different interdental aids on managing gingivitis and how they compare to tooth brushing alone, or to each other. The WF and AFP have both been compared to dental floss. The WF consistently demonstrated superior benefits for reducing clinical signs of gingival inflammation<sup>9-12</sup> and the AFP demonstrated similar outcomes to dental floss.<sup>12,13</sup> The WF has also demonstrated it is more effective

2 weeks	Whole Mouth	Proximal	Marginal	Facial	Lingual
WF	17.3%	3.0%	21.4%	20.2%	14.7%
AF	10.9%	1.1%	12.2%	14.2%	7.7%
Differences between groups	59%	168%	76%	42%	88%
p-value	p=0.001	p=0.005	p<0.001	p=0.013	p=0.002

4 Weeks	Whole Mouth	Proximal	Marginal	Facial	Lingual
WF	25.9%	36.9%	5.3%	29.8%	22.1%
AF	19.8%	24.5%	3.6%	24.6%	15.1%
Differences between groups	31%	51%	46%	21%	46%
p-value	p=0.008	p=0.017	p=0.052	p=0.0648	p=0.004

Table 6: Plaque Index Percent Improvements

than the AFP for plaque removal and reduction of clinical signs of inflammation in randomised controlled trials.<sup>19-21</sup>

This study compared the effectiveness of the WF to the AFP on reducing the clinical signs of inflammation over four weeks using devices sold in the United Kingdom (two-pin models). At all-time points and endpoints, the WF was significantly more effective than the AFP for reducing clinical signs of inflammation. This data is consistent with previous studies that showed the WF was more effective than the AF and AFP for reducing plaque, gingival bleeding and gingival inflammation.

## Conclusion

The Waterpik® Water Flosser is significantly more effective than the Sonicare® Air Floss Pro for improving gingival health. Most notable, the WF was 57% more effective for whole mouth and proximal bleeding on probing and 60% and 68% more effective for whole mouth and proximal MGI scores, respectively.

The WF is significantly more effective than the AFP for reducing plaque for whole mouth (31%), proximal area (51%) and lingual area (46%).

There were no adverse events reported for any of the products used in this study.

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# Working with patients and the public to develop dementia friendly oral health tools

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Key words: dementia, oral health tools, care homes, patient and public involvement (PPI)

## ABSTRACT

**Objectives:** This paper aims to highlight the importance of working with patients and the public in developing oral health research for those living with dementia. As part of working in partnership with care homes and local organisations supporting dementia in the community, this project set out to collect views and opinions on oral health from service users and their carers to inform and guide research.

**Methods:** In a series of meetings with services users and carers attending Alzheimer's support groups, information was collected and collated to inform the research design for a prospective study.

**Results:** The service users and carers manage different levels of oral health hygiene but dementia itself is a big barrier. Access to Dental Care Professionals (DCPs) was a recurring subject of discussion, as were dementia friendly notes at dental practices.

**Conclusions:** This piece of work shows that Patient and Public Involvement (PPI) is essential in highlighting the real issues of mouth care in our local community. Those in caring roles have a significant contribution to make to every day oral health practice, particularly in the development of oral health tools for those living with dementia.

## Introduction

Dental diseases are a major public health problem across the world, despite being preventable. With more evidence stating the links between oral health and general health, focus should be on maintaining an oral hygiene routine and optimal plaque control to not only improve oral health status, but lower the risk of developing other general health problems.<sup>1</sup> Research has revealed links between periodontal disease and cardiovascular diseases, strokes, diabetes and dementia.<sup>2</sup>

It is estimated that 850,000 people in the UK currently suffer from dementia and the figure is expected to double in the next 30 years.<sup>3</sup> In 2016 alone, it was expected that 225,000 people were likely to develop dementia, which equates to one every three minutes. Statistics show that, on average, 80% of the residents in care homes are living with dementia.<sup>3</sup>

People living with dementia often rely on carers to assist them with day-to-day activities, such as brushing their teeth. The Alzheimer's Society<sup>4</sup> recommends that supervision and participation from carers, healthcare assistants and nurses are essential to effectively remove plaque. Many older people are retaining their natural teeth for longer;

conversely the combination of poor oral hygiene and daily medication can result in them being at an increased risk of suffering from oral disease. Commonly prescribed medications can increase the risk of dental decay, periodontal diseases and dry mouth.<sup>4</sup> Oral diseases can also result in pain that can affect an individual's ability to eat or drink.<sup>4</sup> This can subsequently lead to dehydration and malnutrition which can affect healing and weaken an individual's immune system.<sup>5</sup> Oral problems can mean that sufferers withdraw from social interaction, even with their families, ultimately resulting in a poorer quality of life.<sup>6</sup>

The background to this work is based on several study phases which included a local survey (phase one) of care homes in a large seaside town with a unitary authority,<sup>7</sup> which included over 2000 beds in long term residential care settings.<sup>8</sup> The aim of this survey was to work with local care homes to obtain baseline information of oral health provision. The results highlighted the need to work with individuals living with dementia, particularly those working in care homes. Consequently, phase two involved meeting and collecting information from the public, service users and those involved in the delivery of care. This paper reports on a sub-section of this, covering a series of meetings with wives caring for their husbands with dementia and their contribution to every day oral health issues.



INVOLVE is a national advisory group funded by the National Institute for Health Research (NIHR) to support the active public involvement on National Health Service (NHS), public health and social care research. INVOLVE defines public involvement in research as research being carried out ‘with’ or ‘by’ members of the public rather than ‘to’, ‘about’ or ‘for’ them.<sup>9</sup> For example, this includes working with research funders, offering advice, involvement in projects or steering groups, commenting on and developing research materials, and undertaking interviews with research participants. This work enhances the acceptability and relevance of research whilst ensuring it addresses issues of importance to the patient and the public.<sup>10,11</sup> Increasingly, when conducting research, and consequently seeking funding for research, funders require evidence of Patient and Public Involvement (PPI) or whether the research process has been informed by, or with, the patients and the public.<sup>12</sup>

## Aim and objectives

As a result of working with local services in the community, this paper aims to highlight the importance of working with patients and the public in developing oral health research.

The objectives were to collect views and opinions from patients and the public to guide future research and access different groups working and living with dementia, using a PPI approach. This work was subject to ethical approval which was granted by the University of Essex Research Ethics Committee (Ref No: 16005).

This paper reports on the outputs of a series of meetings with wives caring for husbands living with dementia who attend a men’s motivational group run by the Alzheimer’s Society and their contribution to every day oral health issues.

## Method

A qualitative research design was utilised and a series of meetings conducted with service users and their carers. Information was collected, transcribed and thematically analysed.

1. What is the daily mouth care routine?
2. What would you like daily mouth care to be?
3. What are the barriers to giving mouth care?
4. What are the challenges to giving mouth care?
5. How could you see this working?  
Would having a hygienist help?  
Dream package?

The questions used at meetings with the wives

As part of the wider contact phase, the project was communicated at different levels ranging from 6 care home managers, 27 healthcare workers and 29 service users. In total 12 meetings were conducted using the same question schedule (Fig. 1) to extract information on oral health practices. The questions were piloted for the first session and thereafter reviewed for flow and fitness for purpose. The meetings involving those living with dementia were held with a range of people; a wife support group for husbands living with dementia, a respite facility, and residents from one of the care homes who did not suffer from dementia. This paper will only report on a series of meetings with the wives with particular focus on their contribution to every day oral health issues. The other groups will be reported in another paper.



Wives attending one of the meetings

## Data analysis

All the information collected from the service user meetings was transcribed and entered on to a spreadsheet to organise the data. Data were reviewed independently line by line to identify themes. This involved a six-step process: familiarisation; identifying a thematic framework; indexing; charting; mapping and interpretation.<sup>13</sup> Firstly, the overall common and emerging themes from the meetings were identified, and a coding scheme was developed. Data for each theme were reviewed, with illustrative quotes, and examined.

The aim of this approach is to describe and interpret what was happening from the perspectives of the participants (wives) rather than generating more overarching theories, the ‘thematic framework’ approach was found to be suitable.<sup>13</sup> The data presented here demonstrate the range of themes on oral health and the assumptions that exist in terms of the perceptions and expectations of those living with dementia.

## Results

Ten wives took part in a series of three meetings that were conducted by the author, (CC with PP as facilitator) during April to July 2016 in a local Alzheimer’s Society community venue. Notes were taken verbatim and all information collected was anonymised. All the information was collated for each meeting and was reported and verified by the wives to ascertain whether the information was correct at that time. The results have been presented in Table 1.

Several themes were identified: teeth are cleaned with toothpaste and a toothbrush but there are different levels of ability; time constraints, refusal to engage in the task, pride and dementia were found to be the most common barriers. The most common challenges were depression, end of life and dementia. A recurring theme was the difficulty in accessing Dental Care Professionals (DCPs). Those caring for individuals suffering from dementia want to see more dementia friendly notes being used during dental appointments. A range of direct quotes have been used to exemplify the themes.

## Mouth care routine

Some of the wives experienced no problems and brushed their husband’s teeth twice a day, while others described in detail how they felt about the

Main themes	Sub-theme	Sample quotes
Mouth care routine	Teeth are brushed	He has an interdental electronic toothbrush
	Different levels of ability	Has had for years now a Phillips Sonic and I supervise him. It's ok "when he uses it".
	'Bullying session'	Starting off nice, then the shouting begins "I am doing it ..."
	Dental checks	"I'm ashamed when we go to the dentist –she questions whether I am cleaning his teeth – she makes me feel guilty when she says they are very bad
Barriers	Time	Routine, the right time for them, Finding the time to go back and do it
	Refusal	Mood
	Dementia	How they feel on the day
	Pride	Resistance
Challenges	Depression	Try to carry on (with life)
	End of Life	Dementia can be a lonely place
	Dementia	My husband is in a home now, it's hard
		Support group is important hard to know how the dementia will progress It's different every day
How could this work?	Access to dental care professionals	Access to dentist – very lucky, understanding, given a different appointment Dentist gives longer appointments, so more time but we must remind them he has dementia
	Dementia friendly notes	Ladies feel that they must keep telling them (services) that their husband has dementia, it's hard and can be difficult when he is there too.
	Need step by step instructions	Instructions can help Serves to remind

Table 1: Common themes

process and the challenges of brushing or supervising their husband's tooth brushing. The guidance from the Department of Health<sup>14</sup> advises that brushing twice a day for two minutes to keep your teeth and mouth healthy is required. Most wives were aware of this and aimed to do this describing it as part of their daily hygiene routine:

*"...step by step instruction, brushed x2, make it routine and a part of personal hygiene..."*

*"He wants to be on his own brushing his teeth (not doing it together). It's hard work. It's a "bully session" starting off nice, then the shouting begins "I am doing it ..."*

Similar examples of aggression and agitation associated with dementia and associated barriers to providing mouth care have been documented.<sup>15</sup> Other wives found it somewhat easier giving an indication of a reasonably achievable task at home:

*"He has an interdental electronic toothbrush, has had for years now has a Phillips Sonic and I supervise him. It's ok "when he uses it".*

*"No problems with teeth – two times a day and nine monthly visits to dentist."*

When discussing teeth and mouth care some of the wives openly discussed how they felt about going to the dentist:

*"I'm ashamed when we go to the dentist – she (the dentist) questions whether I am cleaning his teeth – she makes me feel guilty."*

*"My husband has gum problems and lost the front teeth and we decided to go ahead with a false plate. He was amenable to the dentist and as soon as we left he said what is this in my mouth and kept fiddling with it. In the end, I removed it as he did not get on at all."*

During the sessions, the wives were asked what they did when their husbands refused to brush their teeth. Some said they would try again later, others just left it until the next time they helped with hygiene needs. Some were openly upset, and shrugged their shoulders. One lady shared her experience of her husband who has advanced dementia and now living in a care home:

*"He has a history of regular visits to hygienists and dentist and was very well kept hair and beard, etc. He liked to brush his teeth hard. Brushed three times a day when at home. He's been in a care home for the last six months and nothing gets done, he won't let carers or me anywhere near." (This lady was visibly upset)*

In their literature review, Chalmers and Pearson (2005)<sup>16</sup> describe the impact of dementia on residential care as demanding and regular oral hygiene care provision is described as challenging for the cognitively impaired resident.

## Barriers

Many of the wives openly discussed the number of barriers they faced daily, such as their husband's "mood, resistance, how they feel on the day and dementia itself being a barrier." Wives described how they were learning to adjust to coping with the changes because of dementia:

*"...might have a routine for a few days and then the dementia just takes over. It's unpredictable."*

In turn, these carers can experience significant levels of emotional stress and physical burden from the demands of caring for a family member with dementia.<sup>17</sup> Their husbands were unpredictable; each day presented changes in their behaviour and some wives were obviously finding this difficult. Many were exhausted with the constant changes and demands on them in their role as a carer:

*"Short term memory loss and order goes, leading to frustration ...and they don't know what to do."*

*"They deny that they have dementia."*

*"...doesn't like being told or "ordered" and simply does the opposite (he deliberately does this)."*

## Challenges

The women generally agreed that their aim was just to get through each day. Regarding tooth brushing, some of the challenges included, "making sure he brushes his teeth" and coping with their husband's "pride, loss of routine and independence". The husbands were completely dependent on their wives for care but it was stressful for the women: "Some days he won't even open his mouth".

Gately et al. (2011)<sup>15</sup> found care-resisted behaviour often creates difficult situations for carers. The wives thought the condition itself was a challenge and they had to learn about dementia, "...carers needed to be

knowledgeable". They met each day as it arrived and accepted that they had to, "try to get on with life". They often found themselves getting very tired quickly and found the support group important. They tried to stick to a routine for their respective husbands and for the dementia, "reminding everyday", "morning and night the same routine". Some wives had a home sitter service, which was helpful and provided respite and time out. The impact of dementia on patients and their informal carers should never be underestimated.<sup>18</sup>

## How could this work?

Most of the wives asked knew that visiting the dentist was important but had experienced some variability in the service available to them. Some commented that, "they were very lucky" with access to the dentist, however others met with hostility, "the way they talk to me (wife) about his teeth and to a person with dementia, it's awful".

Monaghan and Morgan (2015)<sup>19</sup> investigated the concept of direct access by dental therapists and dental hygienists to meet a proportion of dental care in the community. They concluded that this group of professionals could make a large contribution to addressing dental care needs.

Generally, dentists are supportive with comments such as, "the dentist was understanding" and the "dentist gives longer appointments, so more time but we have to remind them he has dementia". Opinions on the dental hygienist were generally positive with such comments as, "He sees a hygienist three monthly and she's very good and I have instructions up by the mirror. The hygienist is very specific with instruction, for example: attention to a particular molar at the back".

Some wives felt strongly about the need for dementia friendly dentists. During their dental appointments the wives repeatedly, "have to keep telling them [dental services] that their husband has dementia, it's hard! Notes need to be labelled or coloured". There should be "Dementia friendly dentists", and "notes should have dementia friendly signs to inform staff". They also suggested that, "dentists should include a clean in the check-up". The National Institute of Clinical Excellence (2016)<sup>20</sup> has produced advice and guidelines for Dementia Friendly Dentistry in primary care. Dementia friendly communities is a national programme run by the Alzheimer's Society<sup>4</sup> which facilitates the creation of dementia friendly communities.

## Discussion

So far, this paper has provided useful insight in to the role PPI can have in preparing for a research project. As part of most research applications for funding, this involvement is necessary for taking any project forward. In a purely qualitative approach to engaging service users and carers, a unique insight was achieved. Qualitative inquiry through narrative allows for the real interpretation and the story telling of participants.<sup>21</sup> It was necessary to gain this insight to inform the integrity of the proposed next phase of the research.

## Mouth care routine

The wives responded with a variety of answers; that it was difficult to do, they felt they were "bullying", whereas others could maintain routine and teeth were brushed twice a day. Brushing teeth may not always be a priority but was often carried out during personal care. Despite some wives aiming to carry out mouth care twice a day, there was a high rate of refusal from their husbands; this is consistent with literature in this area.<sup>22</sup> There have been several research studies looking at mouth care that corroborate refusal to undertake mouth care.<sup>17,23-25</sup> Mouth

care, and barriers to providing care for those with dementia, have been documented by Gately *et al* (2011)<sup>15</sup> for example aggression and agitation associated with dementia and unpleasant oral care tasks, for example: removing and cleaning dentures by Forsell *et al* (2011).<sup>26</sup>

## Barriers

Time, refusal, pride and dementia were amongst the common barriers discussed by the wives. "Mouth care can take a long time". Also, the issue of time affects behaviour: "Only so much time you can spend on encouraging someone to brush their teeth before it causes an increase in aggression."

Aggression and a lack of understanding are common associations with dementia and combined can cause an array of problems when trying to carry out mouth care. A literature review undertaken by Chalmers and Pearson (2005)<sup>16</sup> describes the impact of dementia on residential care as demanding, and regular mouth care provision is described as challenging for the cognitively impaired. Gately *et al* (2011)<sup>15</sup> found resisted behaviour creates difficult situations for staff who are trying to act in the best interests of residents as well as protecting themselves. This presents a difficult situation when coping at home alone and caring for a loved one with dementia.

One of the most frequent responses among the wives was the issue of cost. "Cost is a barrier" and may be a reason for not going to the dentist, or having to pay for expensive treatments to preserve teeth, or have dentures fitted to find they get thrown out, or lost.

Another barrier was dementia itself along with its associations to providing mouth care. "Lack of understanding", "aggression", "biting on the toothbrush" and "mood" were among the few associated barriers. Frenkel (1999)<sup>27</sup> believed healthcare workers should be provided with mouth care training and this theme is raised again by Gately *et al* (2011)<sup>15</sup> who also stress the importance of dementia training. This is very difficult for the wives, however they commented on how they have learnt about dementia, and how important the support group is where they learn a lot from each other and share ideas.

## Challenges

Difficulty accessing dental care professionals was the most prevalent challenge. "You book an appointment and they do not want to go on the day, in the car they ask where they are going, in the dental surgery they want to stop treatment". Additionally, they described visits to the dentist and often on how difficult it is to access or even get an appointment. While direct access is not currently possible within the General Dental Service contract, there could be scope to offer direct access in areas where there are hygienists and therapists working in the community who have special care experience.<sup>19</sup>

Depression is also another challenge. "It is not just those living with dementia who suffer from poor oral hygiene, but the elderly in general - especially those with depression". It is estimated that between 20% and 40% of those living with dementia may also experience depression and the combination of both can lead to negative effects on oral health<sup>4</sup>.

End of life is considered a challenge to providing mouth care as "end of life is the hardest time to do mouth care as they don't open their mouths". NICE (2016)<sup>20</sup> advocate the use of water via a water sprayer, dropper or ice chips in those who are conscious to keep the mouth clean. Kupeli *et al* (2016)<sup>29</sup> state the importance of a multidisciplinary team that draws on different health and social care providers to ensure optimal care. It is clear that carers at home need more guidance.

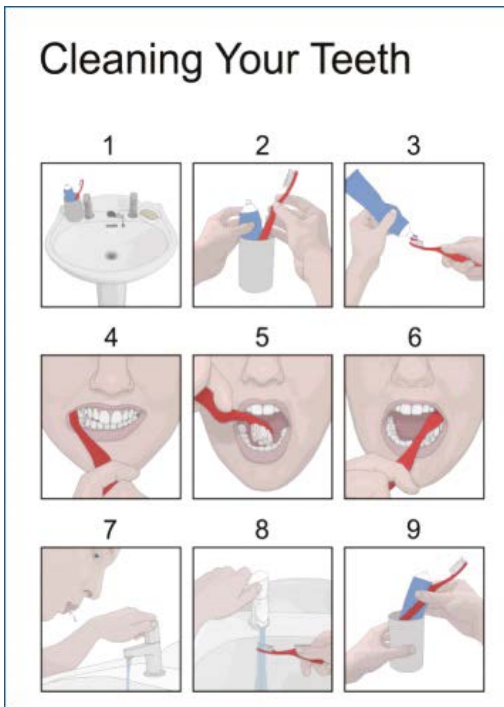


Figure 2:  
Full set of oral health instructions

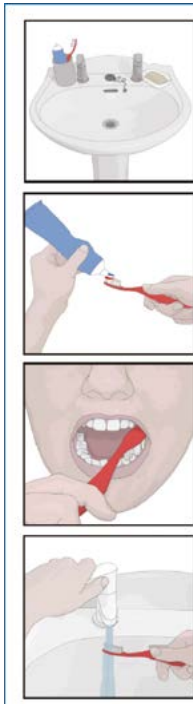


Figure 3: Easy use strip of oral health instructions (wives in the group used this by sticking it on the mirror).

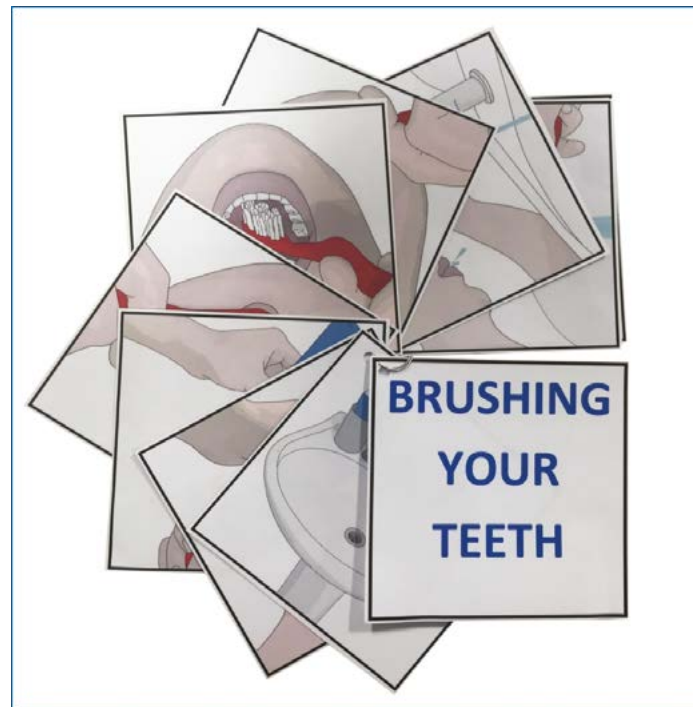


Figure 4:  
Oral health instruction flashcards

## Taking this forward

Difficulty accessing dental care professionals was the most prevalent challenge. *“It’s difficult to get time at the appointment”, “Every time I have to remind them he has dementia”*. There are now guidelines for dementia friendly dental practices with a dementia friendly toolkit for local dental networks.<sup>20,29</sup> The wives discussed having dementia friendly notes, so on arriving at the reception and mentioning their name, the reception or DCP would see a symbol such as the Dementia Friendly forget-me-not flower which is used on dementia friendly hospital wards. The wives also discussed the use of instructions for mouth care at different stages of dementia.

## The co-production of oral health instructions

The wives provided a different viewpoint on oral health care and contributed ideas on the development of managing oral health at home. Throughout the duration of the meetings, the wives articulated their needs and suggested picture guides may help their husbands. At their request the researchers provided a range of already available picture guides but these were subsequently rejected as the design of many was inappropriate and wordy. Consequently, an illustrator (GK) was invited and worked with the dental hygienist (PP) to create some picture guides. Again these were rejected due to the design, which included soft colour sketches and too many words.

With continuous feedback over several sessions, two guides were finally agreed upon. Sequencing the pictures was an issue for the wives and they felt quite strongly about this. They all generally thought, *“less is more”* and were opposed to the inclusion of words: they suggested using numbers as an alternative because their husbands found it difficult to read from left

to right. The sequence and ordering of the pictures was important with the inclusion of numbers and words being restricted to the title. Colours were Dementia Friendly (use of red and blue) and pictures outlined in bold. Figure 2 shows a full set of Oral Health Instructions in number order, all designed by the wives and tailored to their husband’s needs. Figure 3 illustrates an easy use strip of instructions, as requested by the wives. They wanted something that they could stick on to the mirror by the sink in the bathroom. They informed us that the instructions would be useful at various times: living with dementia means each day is different, and their husband’s progress with dementia is a different experience every day.

To further validate these oral health instructions, these were shared with carers working in the care homes who were involved in the collection of information in the wider project. The carers corroborated the wives’ observations and commented on similar issues with mouth care, the progressive nature of dementia and the need for person-centered care.<sup>30,31</sup> The discussions with the carers from care homes led to the design of Oral Health Instruction Flashcards (Fig.4). The pictures were designed in a single format, to help the person remember parts of their own personalised mouth care. Sequencing was not an issue but the flashcards could provide useful prompts during any stage of dementia.

## Implications for practice

An outcome of this work has been to highlight the importance of working with patients and the public in developing oral health tools for those living with dementia. Creating dementia friendly environments and working in collaboration with those living with dementia are fundamental to research in this area. Change is needed in the oral health approach used by DCPs, particularly in dental practices. These results suggest an identified need for DCPs to work in this local community and work more closely with other health care providers to meet the oral health care needs of those living with dementia at home.

## Recommendations for practice

- The outputs of the PPI work suggest the need for further research in this area and, critically, the involvement of those working and living with dementia at home;
- The outputs of this project would indicate that a community based participatory approach maybe the best way forward for future research in this area;
- There is clearly a role for DCPs to work and influence care in the community with those living with dementia.

The project has allowed for some collaborative work in the community with dementia care at the centre. Working with carers at all levels of dementia care is critical for taking good practice forward. A significant output while working with service users and healthcare workers was the development of oral health instruction picture guides to assist those living with dementia with the tooth brushing process. These guides are the result of including PPI as part of the research process

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# Kidsfabriek: Oral health awareness and promotion of oral self-care during a learning and play event for children and parents in The Netherlands

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Key words: public awareness campaign; Kidsfabriek; parents re-brushing behaviour; children's oral hygiene behaviour; oral health-educating and health-promoting intervention; oral/dental hygienist

## ABSTRACT

**Objective:** To determine the impact of a public play and learning approach on the promotion of oral health and oral self-care of children and their parents, or carers.

**Methods:** Questionnaires were distributed to 74 visiting parents and carers to the *Kidsfabriek* 2015 event, building on experience gained during the previous year's event in 2014. A year later during the *Kidsfabriek* event in 2016, 108 children agreed to a semi-structured interview process, following an interactive workshop on tooth brushing by dental hygienists.

**Results:** In 2015, it was determined that 18 (27.3%) parent and carer respondents (middle to high educational level) had never visited a dental hygienist; 26 parents (39.4%) reported to have never been instructed by an oral health professional about how to brush their children's teeth; 33 (50%) brushed their children's

teeth twice per day; 11 (16.7%) respondents reported that they tried to limit their children's snacks consumption.

The *Kidsfabriek* 2016 event was greeted with great enthusiasm by two-thirds of the children involved. On a socio-economic level, 70 (64.8%) parent and carer respondents reported an average household income, while 25.9% (N = 28) said that their income was above average. One-third of adult respondents had not visited a dental hygienist, while 25% (N = 27) stated that they would like to. The children interviewed were very keen to improve their oral self-care and reduce their intake of sugary foods and drinks.

**Conclusion:** Participation in a public health strategy, such as *Kidsfabriek*, may improve children's, and parents', knowledge and encourage them to improve their home self-care.

## Introduction

Oral health promotion is the process by which people, or target groups of people, are able to gain more control over the determinants of their oral health, and improve their oral health.<sup>1</sup> Optimal oral health can be considered a fundamental component of general health, including physical and mental well-being.<sup>2</sup> Recently, a Dutch study looking at social-health-psychology and oral medicine aspects showed that household income and the educational level of the

mother are determining factors in the association between ethnicity and dental caries.<sup>3</sup>

In Holland, currently available programmes, such as 'Gewoon Gaaf' (individual long-term approach) and 'Hou je mond gezond' (collective short-term approach), have been developed for oral health professionals to apply in their practices and in primary schools. These programmes are implemented by 'Ivoren Kruis' (Ivory Cross), which is a Dutch society for the promotion of oral health.<sup>4</sup> In contrast to these two programmes, the *Kidsfabriek* event is a voluntary initiative

set up by dental hygienists and focuses on oral health awareness and intentional behavioural change: the children and their parents, or carers, who visit the *Kidsfabriek* event are encouraged to take responsibility for their oral health and oral self-care. Despite knowing that adequate daily home oral care and regular visits to an oral health professional are the best guarantee for maintaining oral health, many people fail to apply an optimal oral self-care routine.<sup>5,6</sup> By developing personal skills and performing daily oral self-care, most common oral diseases can be prevented.<sup>7</sup> It is particularly important for parents, or carers, to establish from an early age the habit of brushing a child's teeth daily.

A systematic review supports the effectiveness of oral health education and promotion interventions for short-term outcomes. However when preventive oral health care interventions are provided by oral health professionals and implemented at primary schools or workplaces, it has been found that people are often not that well informed, and do not continue with the appropriate behaviour for the long-term.<sup>8</sup> Oral health education and promotion programmes may generate short-term improvements in children's oral health knowledge and in outcome measures, such as attitude related to oral hygiene behaviour and dental visits.<sup>8-10</sup> Long-term behavioural changes related to oral public health campaigns are more difficult to effect.<sup>11</sup>

The present studies aimed to evaluate the impact of an annually recurring regional educational and play campaign during *Kidsfabriek* to promote oral health and improve awareness and knowledge among parents and children:

1. Study 2015 was aimed at obtaining insight into parents' knowledge, habits and oral health care towards their children (supervised brushing and parental re-brushing of their children's teeth after the child had brushed).
2. Study 2016 aimed to determine the impact of a public play and learning approach for the promotion of oral health and parents' and children's oral hygiene behaviour (oral self-care).

## Methods

The field studies for research with human subjects were conducted according to universal ethical principles. Participation of the visitors during the *Kidsfabriek* 2015-2016 was on a voluntary basis. Interested individuals were informed as to what their participation in the study involved, and no pressure was exerted to take part in the survey and the semi-structured interviews by qualified dental hygienists. The dental hygienists' style of delivery of oral health education to the children was based on their own professional daily practice experience. It was not calibrated. The ethical board, Central Committee on Research Involving Human Subjects, affirms that research which requires filling in a questionnaire for one occasion does not fall under the scope of the Medical Research Involving Human Subjects Act.<sup>12</sup>

In 2014, the first and the last author of this paper participated in the *Kidsfabriek* event – a public oral health awareness campaign. This oral health-educating and health-promoting intervention was carried out in a former factory in Ulft, a small rural village in the Eastern part of the Netherlands. In this region there are currently few oral health care practices and dental services available to this community compared to the Western part of the country. This public event is for children aged between 4 and 12 years and includes sports and numerous learning activities related to culture, nature, animals and health. Playful health education is an important entertainment for children, and the *Kidsfabriek* event is considered to be a unique opportunity to promote oral health

messages to parents and children. The aim is to encourage good tooth brushing habits (oral self-care) in a casual relaxed environment away from a dental practice. The 2014 event was considered to be a great success. However, as many children were noted to brush their teeth once per day, rather than the professional and key evidence-based recommendation of twice daily tooth brushing with fluoride toothpaste, four dental hygienists continued their voluntary participation in this public awareness campaign in 2015, and seven continued in 2016 also.

In 2015, a total of 74 parent and carer visitors to the *Kidsfabriek* event were invited to complete a questionnaire, either before or while their children participated in the workshop on tooth brushing. The questionnaire included questions about socio-demographics and oral health behaviour, e.g., visits to dental hygienists, supervised tooth brushing-habits and/or parental re-brushing, and frequency of consuming sugary foods and drinks (snacks).

In 2016, after a professional interactive tooth brushing workshop, provided by volunteer dental hygienists, and after the parents and carers of the children were asked to provide written consent, 108 children were semi-structured interviewed by two dental hygienists (the first and the last author of this paper). The questions focussed on gender, age, tooth brushing frequency, re-brushing by their parents and carers, dentist or dental hygienist visits, sugary foods and drinks consumption, and practices to evaluate their intentional oral hygiene behaviour. The children were rewarded for visiting and participating in the tooth brushing workshop with a 'goodybag' containing various oral health gadgets.

The IBM Statistical Package for Social Sciences 22.0 (SPSS Inc. Chicago, Illinois, USA) was used for data analysis. The data were subjected to frequency distributions, and means, and standard deviations were calculated.

## Results

In the 2015 study, eight guests, grandparents, and other visitors to the *Kidsfabriek* event, who had not given permission for publication of the data, were excluded making the final dataset 66 in total. Table 1 shows the distribution of the sample of parents and carers.

Variables	N (%)	Mean (SD), range
<b>Socio-demographics</b>		
Father	20 (30.3%)	
Mother	46 (69.7%)	
Age (years)		39 (5.8), 27-53
<b>Level of Education</b>		
Lower education	10 (15.2%)	
Medium education	30 (45.4%)	
Higher education	26 (39.4%)	
<b>Oral health behaviour</b>		
Perceived oral health (0 = poor – 10 = excellent)		7.3 (1.2), 7-10
<b>Visiting an oral hygienist</b>		
Never	18 (27.3%)	
Once per year	30 (45.5%)	
Two times per year	15 (22.7%)	
Three times or more per year	3 (4.5%)	

Table 1 - Description of socio-demographics and own oral health behaviour in 2015

The parents (28.8% (N = 19), 43.9% (N = 29), and 26.3% (N = 16), respectively) reported to have one child ( $M^{age} = 8.2$  years), two children ( $M^{age} = 6.7$  years) or up to four children ( $M^{age} = 3.9$  years).

Table 2 shows the distribution of the parents' and carers' oral hygiene behaviour towards the children: supervised tooth brushing-habits and/or re-brushing.

Variables	N (%)
<b>Instructed by an oral health professional about how to brush their children's dentition</b>	
Never	26 (39.4%)
Yes	38 (57.6%)
I don't know	2 (3.0%)
<b>Supervised brushing and/or re-brushing</b>	
Never	1 (1.5%)
Not daily	11 (16.7%)
Once per day	15 (22.7%)
Two times per day	33 (50%)
	6 (missing)
<b>Consuming sugary foods and drinks (maximum of 5-7 times per day) 13</b>	
Not daily	11 (16.7%)
1-2 times per day	34 (51.5%)
3-5 times per day	19 (28.8%)
6 times or more per day	2 (3.0%)

Table 2 - Description of parents/carers' oral hygiene behaviour towards the children in 2015

Disappointingly, 9 (13.6%) parent and carer respondents reported that they considered the limitation of sugary foods and drinks consumption (snacks) as unimportant, and almost 12 (18.2%) parents and carers reported that they were unwilling to try to limit the frequency of their child's consumption of sugary foods and drinks. A total of 23 (34.8%) parent respondents were unaware that toothbrushing should be performed at least one hour after exposure to acidic soft drinks, and 7 parents (10.6%) thought it unimportant to seek alternative drinks, such as water.

2016 was the third consecutive year that oral health promotion had been a part of the *Kidsfabriek* event: 77 (71.3%) children visited the tooth brushing workshop for the first time, and almost a quarter for second. The public campaign was enthusiastically appreciated by 61.1% (N = 66) of the young visitors, with 25 (23.1%) saying that they had fun, and 15 (13.9%) liking it. The children's intention to change their oral self-care and food and drink consumption was high. Two-thirds of the parents (N = 70) of the children who participated in the workshop had an average household income, and 28 (26%) of the parents had a household income above average.

Table 3 shows the distribution of the sample of 108 children.

Variables	N (%)	Mean (SD), range
<b>Socio-demographics</b>		
Boy	36 (33.3%)	
Girl	72 (66.7%)	
Age (years)		7.5 (2.7), 3-16
<b>Knowledge of an oral hygienist</b>		
Yes, I know	20 (18.5%)	
Yes, a bit	40 (37%)	
No, I know little/nothing	45 (41.7%)	
	3 (missing)	
<b>Visiting or having the intention to visit an oral hygienist</b>		
Yes, regularly visits	17 (15.7%)	
Yes, actually visiting	21 (19.4%)	
Maybe, I don't know	12 (11%)	
Maybe like to visit	27 (25.0%)	
Don't want to visit	26 (24.1%)	
	5 (missing)	

Table 3 - Description of socio-demographics and children's oral hygiene behaviour in 2016

## Discussion

The aim of the present studies was to evaluate the impact of a professional oral health education, play and learning approach during the annual *Kidsfabriek* event where oral health and oral self-care among parents and children was promoted. Descriptive findings demonstrate that over all the years these events are appreciated by the children and by their parents. Informal and spontaneous participation was rewarded with a 'goodybag' containing various oral health gadgets, which is current with a child's motivation to co-operate during dental treatment being increased with the offer of a range of rewards.<sup>14</sup>

Parents' and carers' participation in the survey provided insight into their oral health knowledge and of their intentions towards supervised brushing and re-brushing their children's teeth. The children's contributions following the tooth brushing workshop to the semi-structured interviews show the impact that such an approach may have on children's tooth brushing behaviour, their opinions towards dental hygienists and their intentional behavioural change to limit sugary foods and drinks consumption. In addition, it may improve parents' and children's knowledge, and the findings indicate at least a positive short-term impact.

In line with previous studies, oral health-education and health-promoting interventions such as *Kidsfabriek* 2014-2016, led by dental hygienists, may not only encourage an awareness and/or willingness by the parents and carers to take better care of their children's teeth, but may also encourage children's own oral self-care.<sup>8,10,15</sup> Dental hygienists, as highly



motivated professionals specialising in preventive oral health care, play a significant role in promoting oral health and preventing oral disease.<sup>16-18</sup>

It is not clear whether or not the children who participated in the *Kidsfabriek* events had a higher dental caries experience, because most of the parents and carers reported to have an average household income or a household income above average. Children from socioeconomic groups with different ethnic backgrounds or children living in families with lower SES, use more power assertion parenting practices.<sup>3,19</sup>

Both studies are limited because of the small numbers involved. Further limitations are that the various data collected were self-reported opinions, for example about dietary behaviour, but they were not associated with intentional behavioural change. Nonetheless, the *Kidsfabriek* 2014-2016 events showed that population-based, carefully and effectively carried out programmes of personal oral self-care may play an important role in the improvement of oral health awareness. Health awareness is an important first step when it comes to health behavioural change, and therefore the different phases of the Transtheoretical Model of Behaviour Change<sup>20</sup> have to be involved when following oral public health campaign studies. The use of Intervention Mapping (IM)<sup>21</sup> as a protocol for developing theory-based and evidence-based health promotion programmes is conditional, and further research to refine the effects of oral health promotion during *Kidsfabriek* events and other public awareness campaigns is necessary. A Dutch best practice example of an IM and theory based oral health promotion programme for children is 'Trammelant in Tandenland'.<sup>22</sup>

Other findings suggest that to improve children's oral health, educational interventions should focus on both children and mothers to obtain a tailored outcome.<sup>23</sup> Future research should engage parents and carers and include objective clinical and behavioural outcomes in controlled study designs.<sup>9</sup> Regarding the importance of long-term and short-term outcomes for oral health education and promotion programmes, these kind of interventions could be performed in the future with several target groups; children from various socioeconomic groups and ethnic backgrounds, including family members and teachers.<sup>10</sup>

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The authors declare that they have no competing interests.

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# Public awareness and knowledge of the oral health therapy profession in Singapore

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Key words: awareness, public, oral health therapy, profession, Singapore

## ABSTRACT

**Aim:** To gain an awareness of the public's knowledge of the oral health therapy profession in Singapore and create a medium to increase awareness of the profession in Singapore based on the results of the study.

**Materials and methods:** A face-to-face survey questionnaire was conducted with the members of the general public at five different locations spread across Singapore. The surveys were implemented between September and October 2014.

**Results:** A total of 615 completed survey questionnaires were collated and tabulated: 384 (62.4%) respondents stated that they "know nothing" about the profession, 176 (28.6%) have "some knowledge" about the profession while 42 (6.8%) are "familiar

with" the profession. Only 13 (2.2%) respondents were confident that they "know exactly" what Oral Health Therapists (OHTs) can do for them.

**Conclusion:** The public appears to have little knowledge and awareness of the skills and scope of practice of the oral health therapy profession. By educating the public, recognition and appreciation of the work performed by OHTs could impact positively on the oral health of the nation. With an understanding and awareness of how OHTs can help, patients should subsequently be confident and reassured when they are treated by an Oral Health Therapist (OHT). This study found that dentists play a significant role in influencing and educating the public regarding the practise of oral health therapy in Singapore.

## Introduction

The first dental hygiene and therapy training course was established in London in 1983. At that time, there was a dental nursing school in Singapore, but the graduates could only work in public sectors. In July 2003, the first cohort of 27 students was enrolled in the Diploma of Dental Therapy at Nanyang Polytechnic (NYP), Singapore. This programme was created to meet the dental needs of children in the school dental clinics.

In 2004, NYP incorporated the dental hygiene curriculum into the diploma programme, to meet the increased dental needs of the adult population. This programme aimed to provide holistic education for oral health therapy students to become skilled in both dental hygiene and dental therapy procedures. Last year, the Diploma in Dental Hygiene and Therapy programme was changed to the Diploma in Dental Therapy.

To practise as an OHT in Singapore, an individual has to be licensed by the Singapore Dental Council. OHTs are trained to provide dental services such as scaling and polishing of teeth, fillings and extractions of primary teeth for patients below 18 years of age as

well as providing oral hygiene instruction. OHTs work under direct, and indirect, supervision of dentists. Despite the first cohort of OHTs graduating from Nanyang Polytechnic in 2005, it was not until three years later, in 2008, that OHTs were granted a licence to practise in both public institutions and private practices under the Dental Registration Act.

At this time, the OHTs in Singapore, in comparison to their professional peers in Australia, were rigidly controlled. The profession of dental hygiene in Australia was increasingly becoming highly regarded with independent professionals and academics engaged as public health specialists. In New Zealand, similarly to Australia, there was a high level of recognition for dental therapists. New Zealand pioneered the development of the dental therapy profession in 1921. By 2013, the total number of practising dental therapists was 874. Dentists in New Zealand value dental therapists and perceive them to be an asset to the workforce.<sup>1-3</sup>

In 2013, 345 OHTs were practising in Singapore. By 2016, this figure had risen to 401 OHTs compared to 2,198 Dentists. However, given the clinical remit of dually qualified OHTs, their contribution to the treatment of dental diseases and maintenance of oral health for the

Singapore population could be more expansive. The benefit of having access to OHTs could be maximised if the Singapore public was aware and knowledgeable about the skills and scope of practice of the oral health therapy profession.

The population in Singapore increased by about half a million between 2008 and 2013, with an ageing demographic that brought with it a growing demand for specialised dental care.<sup>4</sup> At the same time, many dental needs were unmet due to such barriers as time constraints, high cost of treatment, lack of dental education and lack of dental providers. No study was ever conducted to discover the degree of public awareness and knowledge of the abilities and treatment available by dental hygienists and therapists in Singapore. A small number of similar studies have been undertaken in other countries but most of these focused on the dentists' perceptions, not those of the public.<sup>5-7</sup>

Assessing the public's awareness and knowledge is useful; the oral health therapy profession was created to better serve the public and address some of their unmet dental needs.

A review of relevant past studies was undertaken, of which databases, such as Journal Gateway and Nanyang Polytechnic's Library Portal, were utilised. Search terms included: awareness, attitudes, dental, dental hygienist, dental therapist, knowledge, oral health therapist, oral health, perception and public.

In one small study<sup>8</sup> the experiences of at least 15 adult patients receiving treatment from dental therapists in South Yorkshire, UK were examined. It was reported that the participants had positive experiences of their treatments. Although the awareness of the role played by a dental therapist was low, the trust in the dentists delegating care seemed to reassure the study participants. Dentists appeared to play a significant role in influencing patients' awareness of the role of the OHT. Acceptability was high partly due to trust imparted by the referring dentist. The study also highlighted that patients' level of awareness was affected by the trust the patients had in their dental therapists, which was dependent upon the treatment received. The participants chose good experience over qualifications when receiving treatment from dental therapists.

In another comparative cross-sectional study in Sweden<sup>9</sup> the differences in patients' attitudes towards dental hygienists (DH) and also towards the dentists, were examined using the Dental Belief Survey (DBS-R) and Dental Hygienist Belief Survey (DHBS). It was highlighted in this study that the participants were more comfortable being treated by dental hygienists compared to dentists, because they spent more time with the dental hygienists than the dentists

during their regular preventive visits. The study found that *participants having a less negative attitude towards dental hygienists was deemed as an important finding for future dental hygiene care*. It would appear that acceptance of our profession is dependent on the public's awareness and value of our skill set and knowledge of how it can benefit them.

In another study, a telephone survey was undertaken to investigate public awareness and the social acceptability of dental treatment provided by dental therapists in the UK.<sup>10</sup> Only ten percent of the respondents admitted an awareness. Furthermore, none of the respondents was able to correctly identify the permitted duties of the dental therapists. There was also low acceptability of dental therapists across the UK. Some elderly patients had expressed a preference to be treated by dentists in some circumstances. There was an obvious need to raise the profile of these professionals and increase awareness and acceptability in the UK. The findings identified a need for public education and reassurance, emphasising the training of the dental therapists, their permitted duties and the rationale for incorporating these clinicians in the practice of dentistry.

In November 2013, a study was undertaken by a group of Diploma in Dental Hygiene and Therapy students from Nanyang Polytechnic. The aim was to research the dentists' perceptions of the oral health therapy profession in Singapore by carrying out a web-based survey which was completed by 80 dentist members of the Singapore Dental Association.<sup>11</sup> A key finding of the study highlighted dentists' limited knowledge of the practice of oral health therapy, with barely half of the respondents able to correctly identify all elements of the OHT scope of practice. Although the dentists were fairly optimistic about employing OHTs, they were unsure as to how they could engage the OHTs effectively and utilise their skills fully. Dentists had to be well-versed with the oral health therapy profession in order for the value of integrating OHTs into the dental team to be appreciated.

## Aim and objectives

The aim of this work was to conduct a study to determine the public's awareness and knowledge of the profession in Singapore with the following objectives:

1. Examine the awareness and assess the knowledge of the general public towards the oral health therapy profession;
2. Evaluate the interest of the general public to learn about the oral health therapy profession;
3. Create a medium to increase the awareness and knowledge of the oral health therapy profession to the public.

## Materials and methods

An initial pilot survey was undertaken involving 45 participants and was carried out to assess their knowledge base with the question, "Do you know what the oral health therapy profession is?" The results revealed that 40 of the 45 respondents were unaware of the OHT profession, which further stressed the need for more data collection.

Subsequently, a face-to-face survey method was then chosen to collect data for a larger study. Targeted respondents were members of the general public of Singapore, who were English literate, and thirteen years of age or older ( $\geq 13$  years old). During study design and implementation, the first-time researchers overlooked the need to determine an appropriate sample size for the study and the goal to achieve a minimum of 500 responses was determined out of practicality due to time constraints of a low-cost, final-year school project.

A total of 615 face-to-face surveys were conducted, over five weekends, at five random locations (north, northeast, east, west, and central) around Singapore, to obtain a sample size representative of the general public. Large scale events and open-spaced areas with constant human traffic flow were picked as the designated venues. At each location, the time spent collating the surveys involved at least two and a half hours. Collation of the survey questions was carried out from mid-September to mid-October 2014. Due to manpower constraints, the authors carried out the interviews, a first-time experience. Although there was communication between the novice researchers, no standardised training and calibration efforts were made.

Interviewers approached the public without bias towards any particular targeted age group, gender or race. However, possible participants who appeared to be occupied in other obligations were not approached.

Instructions to interviewers:

- Introduce yourself
- Inform participant of the rationale behind this study and advise that it is an academic project which aims to be of future use in public health
- There should be no mention of any incentives for participation. It should only be mentioned upon completion of survey.
- Obtain verbal consent from the participant before proceeding to attempt the survey.
- Ensure anonymity of participants.

Participants were informed about the rationale and advised that this study was an academic project. Verbal consent was obtained before participation and anonymity was assured.

Ethics approval was not sought as the entire study stemmed from a pilot study for a final-year school project without any intention or ambition for publication. A retrospective attempt was made to seek ethics approval but not followed through.

## Survey

The survey included a total of ten required questions, three additional questions to which some respondents would need to respond, and one optional open-ended question. The first part of the

survey required the respondents to specify their demographic profile including age, gender, race, highest educational level and current occupation.

### 6) Select a statement from the following that **BEST** describes you:

- I know nothing about the Oral Health Therapy profession (Go to Question 11)
- I have some knowledge about the Oral Health Therapy profession
- I am familiar with the Oral Health Therapy profession
- I know exactly what an Oral Health Therapist does

Fig.1 - Knowledge of the Oral Health Therapy profession

Among the questions, the respondents had to select a statement that best described their knowledge of the oral health therapy profession at the time of survey (Fig.1). They were asked about their sources of information e.g. their dentists, their families and friends and if they were being treated by an OHT. The respondents were questioned about their understanding of the primary role of OHTs and permitted skills and scope of practice.

### 11) Will you be interested in learning more about the Oral Health Therapy profession?

- Yes
- No (Go to Question 13)

### 12) If yes, what would you like to learn **MOST** about the Oral Health Therapy profession?

- Job scopes of an Oral Health Therapist
- Education and training of an Oral Health Therapist
- Where you can find Oral Health Therapists
- Differences between an Oral Health Therapist and other dental professionals
- Other: \_\_\_\_\_

### 13) If your answer is no, the reason is:

- I do not see the need to know now
- I have a regular dentist who I am currently pleased to see
- I already know everything about the Oral Health Therapy profession
- I am unsatisfied with the dental treatment previously provided by an Oral Health Therapist
- Other: \_\_\_\_\_

Fig.2 - Level of interest in knowing more of the Oral Health Therapy

In addition, if participants responded that they had no knowledge of oral health therapy professionals they would be requested to answer the three additional questions, (Fig. 2) to gauge their level of interest in learning more.

## Results

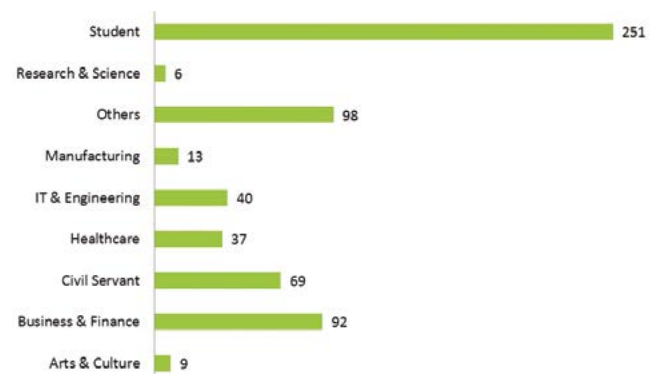


Fig.3 - Occupation of respondents

A total of 616 surveys were conducted of which 615 were completed. No data on the total number of people declining participation was collected. Of the 615 respondents who participated, 352 (52.2%) were female and 263 (47.8%) male. In terms of ethnicity, 418 (68%)

were Chinese, 98 (16%) Malay, 62 (10%) Indian and 37 (6%) other. A total of 251 (40%) respondents were students (Fig. 3).

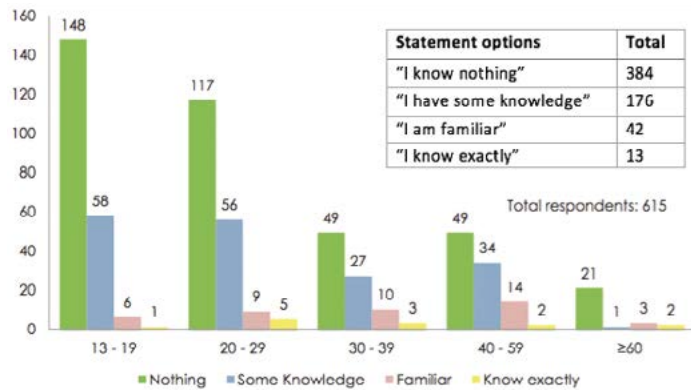


Fig.4 - Knowledge of the Oral Health Therapy profession

In question 6 (Fig. 1) where all participants were asked to select one statement that best described their level of knowledge about the profession, 384 (62.4%) respondents chose the statement: 'I know nothing about the OHT profession' (Fig. 4). These respondents were directed to skip to Question 11 (Fig. 2) while the other 231 (37.6%) respondents were asked to continue with the remaining questions.

For the 231 (37.6%) participants who indicated that they had at least some knowledge of the profession, 209 (90.5%) respondents expected that an OHT should have graduated with at least an A-level certificate or a diploma. Among those 209 respondents, 75 (35.9%) expected an OHT to have a degree to practise.

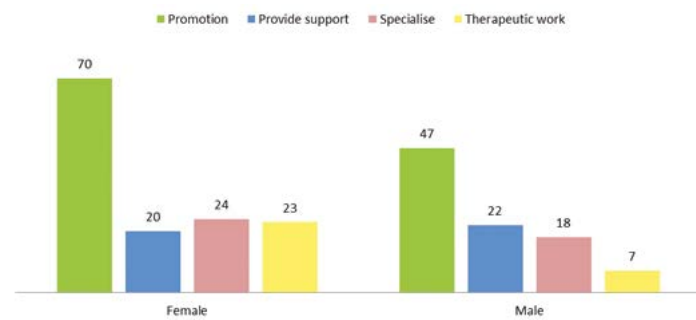


Fig.5 - Primary role of OHT as identified by 231 participants who had some knowledge of OHT profession

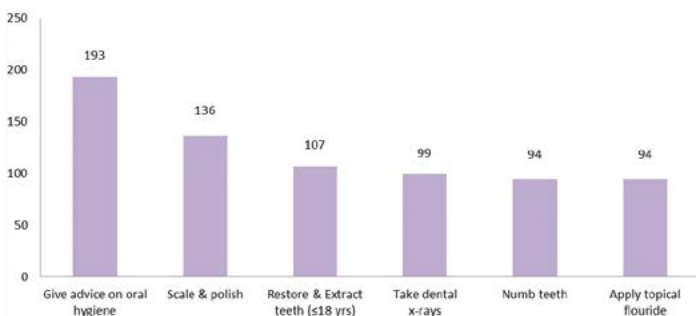


Fig.6 - Identification of the OHT work scope

Within this group of 231 (37.6%) participants, 118 (51.1%) indicated their dentists to be their main source of information about the profession. Of the 231 participants, 117 (50.6%) identified the primary role of an OHT was to focus on health promotion and disease

prevention (Fig. 5). The 231 (37.6%) respondents who indicated that they had at least some knowledge of the profession were given six options to identify the professional scope of an OHT and checked all that applied (Fig. 6).

When respondents were asked if they would like to find out more about this group of clinicians, 349 (56.7%) indicated "yes" while the other 266 (43.3%) respondents replied "no". For those who indicated an interest, they elaborated that they would like to know more about the differences in the job scopes between dentist and OHT, including where an OHT is likely to be employed and the education and training undertaken. In contrast, the 266 (43.3%) respondents who indicated no further interest in knowing anything more about these professionals stated that they were already treated by dentists, or they did not have a desire to learn more.

## Discussion

More than half, 384 of 615 of respondents, regardless of their ages, stated that they had no idea what OHTs could do for them. Disappointingly, public awareness and knowledge of the oral health therapy profession is generally low. If this sample population is representative of the general public, then measures need to be considered to actively promote the oral health therapy profession and educate the public as to how OHTs can best serve them.

Regarding the qualifications required to study as an OHT, 75 (35.9%) respondents thought this group of clinicians should have a degree. As qualifications obtained appears to affect acceptability, a future opportunity for a Bachelor of Oral Health programme, similar to the UK, available locally, may increase the Singapore public's acceptance of treatment from an OHT. In general, the Singapore public was not fully aware of the minimum qualification required to gain entry to study as an OHT. Only 15 (6.5%) respondents indicated that they were familiar with this group of clinicians because they had been treated previously by an OHT.

There was an observation that some dentists tried to educate the public about our remit and skills. Among the 231 respondents who indicated that they had at least some knowledge of the oral health therapy profession in their responses to Question 6, 118 (51.1%) pointed out that their dentists were their primary source of information on the oral health therapy profession. However, these respondents had only expressed 'some knowledge' about the OHT's permitted skills which may imply that their dentists might not have effectively introduced or educated their patients regarding the job scope and capability of OHTs. From the results of the small study<sup>8</sup> on the experiences of adult patients receiving treatments from dental therapists in South Yorkshire, UK, dentists could be instrumental in influencing patients' awareness of OHTs. Dentists may need to be more informed and educated regarding the full scope of practice of an OHT in order to be willing to promote our skills.

In a separate study<sup>10</sup> on public awareness and social acceptability of dental treatment provided by dental therapists, low awareness and understanding of the dental therapy profession in UK was concluded without any respondent capable of correctly identifying the permitted duties of dental therapists. In this study, among the 231 respondents who indicated that they had at least some knowledge of the oral health therapy profession, 136 (58.9%) were able to identify that the job scope of an OHT

includes scaling and polishing and 193 (83.5%) respondents correctly determined that OHTs render advice on oral hygiene.

Of the same 231 respondents who indicated that they had at least some knowledge of the oral health therapy profession 117 (50.6%) were able to identify the key role of an OHT is to be involved in oral health promotion and disease prevention. However, only 15 (6%) respondents had received treatment from an OHT. There seemed to be an apparent discrepancy between the respondents' knowledge of the oral health therapy profession and the actual number of respondents being treated by OHTs. The reasons behind could be explored to encourage more patients to recognise OHTs and therefore be open to accept treatments provided by OHTs.

In this study more than half, 349 (56.7%), of the total 615 respondents expressed interest in knowing more about OHTs. There was an obvious interest in gaining a better understanding of the differences in job scopes between dentist and OHT.

Respondents who were not interested in learning more about the profession and what OHTs have to offer to patients, had stated that they "*do not have a need to know now*," which could be inferred as low dental awareness among the Singapore public. The public might not fully recognise the importance of good oral health to appreciate the critical role of OHTs in disease prevention and health promotion. Of course many respondents stated that they visited their dentist regularly and were comfortable with the status quo. The trust that the public imbues in their dentist could be tapped into and help to positively influence them, and improve their acceptance of OHTs' clinical skills.

There is a clear need for the public to be educated about OHT training and education. OHTs possess dental skills which can ultimately improve dental patients' access to routine dental treatment and free up the clinical time of the dentists to focus on more complex treatment needs.

Most of the respondents who had indicated an interest in learning more about the profession were between the ages of 13 and 19 years, highlighting that this demographic is receptive to learning more about a relatively new profession.

## Limitations

The survey questions were only in English Language. Hence, only people who were English literate would understand and attempt the survey. Having the survey available in various languages could solve the problem but time was a constraint and translating into other languages might have a different meaning from the original context.

The target age group for the respondents was  $\geq$  13 years old as younger participants may not fully

understand the survey questions which would affect the reliability and accuracy of the results.

During the survey collection, people in the younger age group tended to be more willing to stop and interact with the researchers, and attempt the survey as compared to the older age group. The reason could be due to the fact that the ages of these respondents were similar to those of the researchers (who were on the average about 20 years old): the data analysis showed that age group 13-19 was the highest respondent in the survey.

Furthermore, a more unbiased approach for the survey execution could have been achieved if had it been double blinded and engaged interviewers with no prior information about the research.

There was limited time for data collection. Thus, the number of respondents might not be reflected as a significant sample size to adequately represent the majority of the Singapore public..

## Conclusion

From the responses of the Singaporeans who agreed to take part in this study, it can be concluded that:

- There is generally low awareness and knowledge of the oral health therapy profession among the general public of Singapore.
- There is a lack of information from the different sources mentioned, as well as misconceptions from the public on the training, qualifications and the primary role of this skilled clinical cohort.

The importance of working as a dental team plays an influential role in promoting the oral health therapy profession and building trust in patients. This is emphasised, with cross reference to the small study<sup>8</sup> done in South Yorkshire, UK from July 2011 to May 2012 and the pilot study on dentists' perception of the oral health therapist (OHT) profession in Singapore done in 2014, as mentioned above.

This sample of the general public was receptive to receiving information about the OHT profession, suggesting that the dental profession needs to utilise all means available to educate the public, enabling dentists and OHTs to work together effectively and efficiently to improve the health of the nation. This could include a public information campaign and literature, which the authors designed as a result of this study.

## Future prospects

In the future, more insightful information may be obtained from an improved version of this study through measures including determining an appropriate sample size to better represent

the population in Singapore. Future surveys may include assessing the acceptability of the oral health therapy profession, evaluating the effectiveness of the brochure produced by the authors, as well as the perspectives of OHTs towards their profession. OHTs and dentists could work more closely to promote our skill set and ensure more effective team working, which would have a positive impact on patients' oral health. Dentists are the catalyst to increasing awareness, knowledge and acceptability of OHTs to their patients, but OHTs need to be proactive too.

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  - Lin Liang Chen (Survey formatting, data collection, reporting of descriptive statistics & results of the study).
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# Does glycine powder impact on clinical attachment levels and subgingival biofilm in adults with periodontal disease? A systematic review summary

P Hilson

Key words: periodontal disease, glycine powder, air polishing

## ABSTRACT

**Introduction:** Conventional methods of ultrasonic scaling (USS) and mechanical hand instrumentation (HI) aim to disrupt the subgingival biofilm. Currently, these methods can be traumatic, not only to tooth tissues but also for patients receiving treatment. Air polishing systems have been introduced as an alternative and the recent development of glycine powder agents has yet to be reviewed independently.

**Aim:** To review the clinical effectiveness of glycine powder on adults with periodontal disease by measuring clinical attachment levels and subgingival biofilm.

**Methods:** A stringent search of the clinical question was searched against a comprehensive electronic database with subsequent searches through hand searching, grey literature and reference lists. Extensive literature was screened against an inclusion and exclusion criteria; studies which progressed were subject to a McMasters to screen their methodological qualities

**Results:** From the six randomised controlled trials identified, evidence was found to support a reduction in periodontal pocket depths (PPDs) following the application of glycine powder within an air polishing system. Similarities were also reported in the results of subgingival biofilm counts, with total bacterial counts and individual species *Porphyromonas Gingivalis* (Pg), *Aggregatibacter Actinomycetemcomitans* (Aa) and *Tanerella Forsythia* (Tf) reporting reductions. These results may be considered statistically significant.

**Conclusion:** Evidence from this review shows that this exposure within dental practices is a viable method of reducing subgingival biofilm and PPDs. High safety, patient satisfaction, efficacy and potential profit permits this exposure of glycine powder to be recommended, however a systematic review to compare against conventional therapy would be advantageous.

## Introduction

Current air polishing systems provide an ergonomic alternative method of removing subgingival biofilm.<sup>1</sup> The introduction of such abrasive devices dates back to 1945 where they were used for restorative preparations<sup>2</sup>, these early uses were developed and air polishing devices were introduced in the late 1970s.

Sodium bicarbonate (NaHCO<sub>3</sub>) powders were first used within this technology, being an ideal abrasive medium that is non-toxic and water soluble with a particle size of 250 µm.<sup>3</sup> Effective at removing staining, caution over prolonged use is advised due to tooth tissue loss and severe epithelial erosion.<sup>4,5</sup> To resolve this issue continued advancements in air polishing powders have developed a glycine based powder which is up to four times smaller (<45µm) than NaHCO<sub>3</sub>, resulting in less surface damage with equivalent ergonomics.<sup>6</sup>

Glycine is a naturally occurring amino acid, nontoxic and water soluble. Its non-salt taste increases patient acceptance and intra oral suitability. Glycine is considered to be anti-inflammatory, with an ability to decrease some free radicals which may lead to tissue damage.<sup>1,7</sup>

As the main species responsible for periodontal disease (PD) *Porphyromonas Gingivalis* (Pg), *Aggregatibacter Actinomycetemcomitans* (Aa), *Prevotella Intermedia* (Pi) and *Tanerella Forsythia* (Tf) form complementary communities with neighbouring bacteria to avoid elimination. Such bacteria produce endotoxins and lipopolysaccharides (LPS), which, stimulate a potent immune and inflammatory response with subsequent soft and hard tissue damage.<sup>8</sup> Reducing bacterial loads should have a positive outcome for periodontal pocket depths (PPD).

Conventional treatment, although shown to be successful, is often dominated by the levels of discomfort for patients during treatment. Glycine powder appears to be received positively by patients<sup>9</sup>, and if this



technique is proven to be effective, it may be an ethical option to offer.

The aim of this paper is to provide a summary of the systematic review produced to identify the clinical effectiveness of glycine powder on clinical attachment levels and subgingival biofilm.

As this is a summary of a systematic review produced for a third year dissertation, sources that have been accessed from published material available in the public domain (journals, conference proceedings, press articles, websites and other electronic sources) do not need formal ethical approval or release.

String Number.	Synonym
1	Gum Disease
2	Periodontal Disease
3	Periodontal Syndrome
4	Periodontitis
5	Periodo*
6	1 OR 2 OR 3 OR 4 OR 5
7	Glycine
8	Glycine Powder
9	Lipids
10	7 OR 8 OR 9
11	Air Flow
12	Air Polish
13	Air Polishing
14	11 OR 12 OR 13
15	10 AND 14
16	Biofilm
17	Dental Biofilm
18	Bacteria
19	Porphyromonas Gingivalis
20	Prevotella Intermedia
21	Aggregatibacter Actinomycetemcomitans
22	Tannerella Forsythia
23	Periodontal Probing Depth
24	PPD
25	Clinical Attachment Level
26	CAL
27	Periodontal Attachment
28	Periodontal Pocket Reduction
29	16 OR 17 OR 18 OR 19 OR 20 OR 21 OR 22 OR 23 OR 24 OR 25 OR 26
30	6 AND 15 AND 29

Figure 1: Synonyms

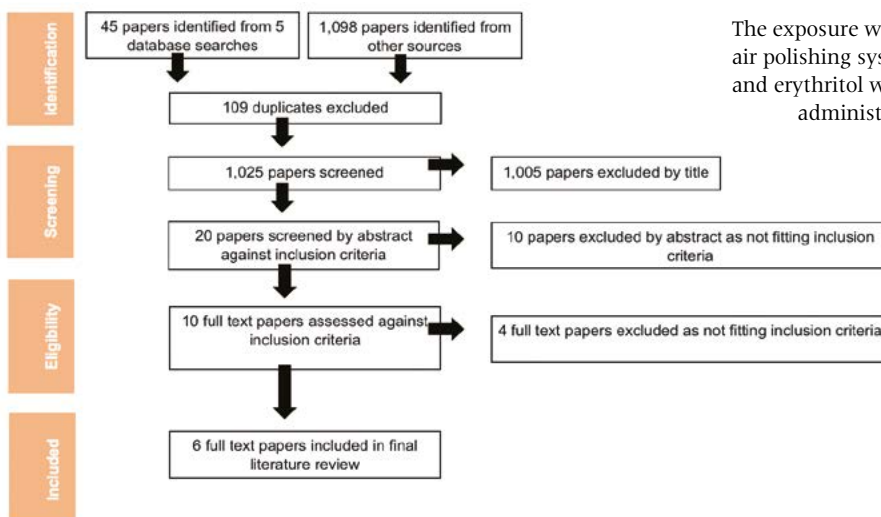


Figure 4. PRISMA diagramme identifies the search process

Database	Dates Covered
CINHAL (EBSCOhost)	Non Specific
Dentistry and Oral Science (EBSCOhost)	Non Specific
MEDLINE (EBSCOhost)	Non Specific
AMED (EBSCOhost)	Non Specific
Embase (Ovid)	Non Specific

Figure 2: Electronic databases

Hand Search of Journals
International Journal of Dental Hygiene
Journal of Periodontology
Journal of Clinical Periodontology
International Journal of Periodontics and Restorative Dentistry
Periodontology 2000
British Dental Journal
The Journal of the American Dental Association

Figure 3: Hand searched journals

## Current literature

To date, no systematic review has been conducted assessing the effectiveness of glycine powder on clinical attachment levels and subgingival biofilm. A literature search was undertaken resulting in no hits using online search engines: Cochrane Library, Database of Abstracts of Reviews of Effects (DARE), Cochrane Database of Systematic Reviews (CDSR), National Institute for Health and Clinical Excellence (NICE), National Institute for Health Research (NIHR), The Campbell Collaboration Library of Systematic Reviews, Database of Promoting Health Effectiveness Reviews (DoPHER) and TRIP.

## Method

A stringent literature search under university guidelines of the clinical question with associated synonyms can be seen in Figure 1. This was searched against electronic databases (Fig.2) and hand searches (Fig. 3) with further searches within Grey literature and of the Reference Lists.

The population was limited to patients over 18 years of age with a clinical diagnosis of periodontal disease: children were excluded. Patients would not be excluded if they were a smoker as once results are published they may not be generalisable to the wider population, however patients who have received antibiotics prior to the trial would be excluded as such medication may reduce reliability of results due to contamination bias.

The exposure was a low abrasive glycine powder provided from an air polishing system targeting subgingival pockets. Sodium carbonate and erythritol were excluded as sodium carbonate is unable to be administered subgingivally and erythritol is a new product with limited research.

The outcomes measured would be clinical attachment levels, periodontal pocket depths and biofilm bacterial levels. Bleeding on probing and recession would be excluded as these fail to represent periodontal tissue responses to treatment required within the inclusion criteria.

Randomised Controlled Trials (RCT) and Clinical Trials were included due to the ability to determine whether an exposure is effective or not. Trials lower than RCT were excluded from this review as the methodology of such designs may reduce integrity of the review.

Extensive literature was screened against an inclusion and exclusion criteria defined at the start of

Paper No.	Database	Authors	Date	Title	Journal	Citation Information
1	CINHAL	Kargas, K., Tsalikis, L., Sakellari, D., Menexes, G., and Konstantinidis, A.	2015	Pilot study on the clinical and microbiological effect of subgingival glycine powder air polishing using a cannula like jet.	International Journal of Dental Hygiene.	13 (3) 161-169
2	CINHAL	Fleming, T.F., Arushanov, D., Daubert, D., Rothern, M., Mueller, G., and Leroux, B.G.	2012	Randomized Controlled Trial Assessing Efficacy and Safety of Glycine Powder Air Polishing in Moderate-to-Deep Periodontal Pockets.	Journal of Periodontology.	83 (4) 444-452
3	CINHAL	Wennstrom, J.L., Dahlen, G., and Ramberg, P.	2011	Subgingival debridement of periodontal pockets by air polishing in comparison with ultrasonic instrumentation during maintenance therapy.	Journal of Clinical Periodontology	38 (9) 820-827
4	Dentistry and Oral Science	Moene, R., Decalliet, F., Anderson, E., and Mombelli, A.	2010	Subgingival Plaque Removal Using a New Air-Polishing Device	Journal of Periodontology	81 (1) 79-88
5	Hand Search	Petersilka, G. J., Steinmann, D., Haberlein, I., Heinecke, A., and Flemmig, T.F.	2003	Subgingival plaque removal in buccal and lingual sites using a novel low abrasive air-polishing powder	Journal of Clinical Periodontology	30 (4) 328-333
6	Grey Literature	Petersilka, G. J., Tunkel, J., Barakos, K., Heinecke, A., Haberlein, I., and Flemmig, T.F.	2003	Subgingival plaque removal at interdental sites using a low-abrasive air polishing powder.	Journal of Periodontology	74 (3) 307-311

Figure 5: Papers included in the review

the review (Fig.4). Twenty papers were initially identified and six randomised controlled trial (RCT) papers were selected as eligible for the review (Fig. 5). A McMaster was used to screen Methodological Quality to assess strengths and weakness of the trials.

## Main findings

The six studies selected were included to assess the clinical effectiveness of glycine powder on clinical attachment levels and subgingival biofilm (Figs. 6-9). Evidence was found to confirm that PPD were reduced following the application of glycine powder. Similarities were reported in the results of subgingival biofilm, whereby total bacterial counts and individual species Pg, Tf and Aa reported reductions.

Papers one, two and three (Kargas *et al* 2015, Fleming *et al* 2012, Wennstrom *et al* 2011) all assess levels of PPDs between various review times; though papers one and two presented poor results to support the use of glycine powder against either outcome during the trials, results fluctuated. Yet paper three proved increased reductions of PPDs with a subsequent reduction of the number of sites with pocketing >5 mm, although ethical issues surrounding the exposure reduce reliability of these results.

Measurements of total bacterial counts in papers two, five and six (Fleming *et al* 2012, Petersilka *et al* 2003, Ptersilka *et al* 2003) highlight homogenous results of reductions, though paper one indicates bacterial counts increasing between baseline and end of trial. When assessing bacterial species papers two, three and four collectively agree the sites that were positive with Pg were reduced; sites of Tf decreased in papers three and four yet remained unaffected in paper two. Additionally, Aa in paper three increased in the number of positive sites, whereas paper four specified significant reductions.

## Study design

The setting of all trials took place within dental hospitals of various locations globally. Due to the accessible nature of patients, selection bias presents reducing the external validity as a true population has not been obtained. Although patients should have an equal chance of being selected, when institutions are the setting of the trial a list of accessible, existing patients often becomes a convenient source to sample. This presents characteristics of non-probability sampling and reduces the external validity of trials.<sup>10</sup>

Study funding or sponsorship is fundamental when questioning validity of study design and may present as a conflict of interest. Paper one was the only trial to clearly state that funding was obtained from within the institution, therefore results from this trial

are not affected by funding bias. All other papers either inform of industry funding or fail to mention the source of funding, invoking bias.

The overall quality of these trials was conventional and representative of an RCT, although some limitations of the internal methodology were observed. All trials stated that patients were randomly allocated into treatment groups, true of an RCT. Papers one and three use computer generated lists whereas papers two, five and six specify block randomisation to achieve balance within groups as equal numbers are assigned to each group.<sup>11,12</sup> This prevented selection bias to increase internal validity. However, paper four makes no attempt to distinguish the exact methodology used to randomise patients.

Although most of the papers report blinding, considerations must be given; when an experimental trial is being conducted with an obvious exposure it is extremely difficult to blind both patients and examiners.<sup>13</sup>

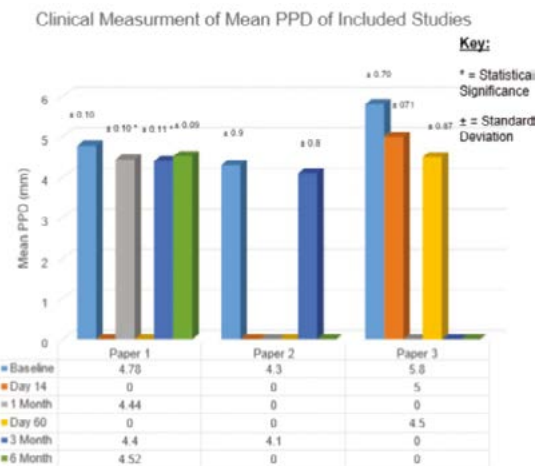


Fig 6: Measurements of PPDs

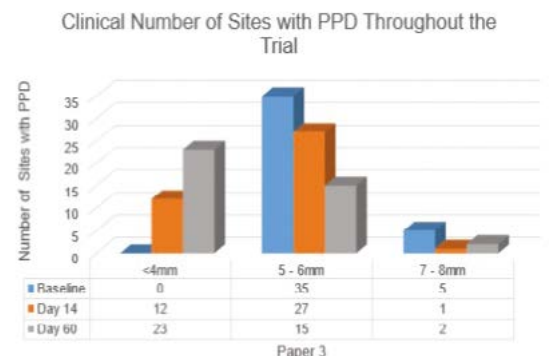


Fig 7: Number of sites with PPDs

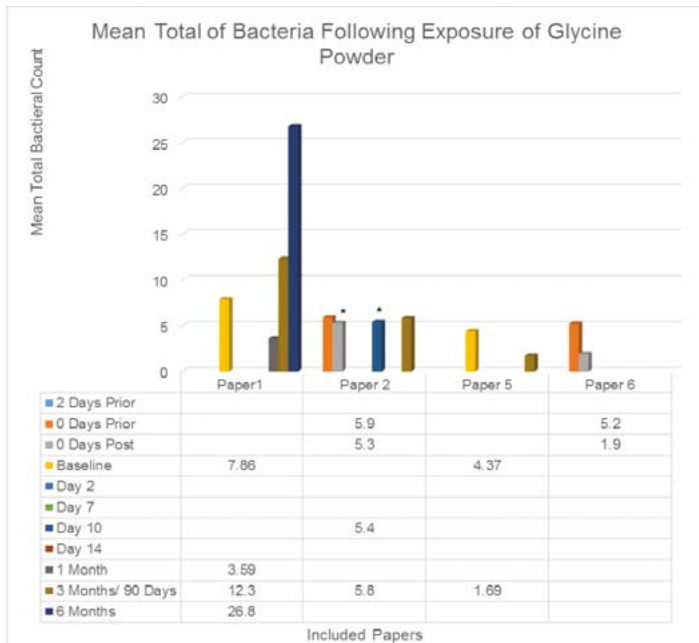


Fig 8: Mean total of bacteria

## Population

The six studies contained a range of population sizes. Unjustified or overestimated samples may risk unethical exposure.<sup>14,15</sup> Papers one, two, three and five justify the sample with a power calculation whereas papers four and six fail to report such methodology. The population samples, of fifty in paper four and twenty-four in paper six, may now be disputed as either over or underestimated, generating ambiguity towards results as well as being unethical.<sup>16</sup>

All papers include an age greater than that of the specified age of the inclusion criteria; age is relative to lifetime exposures of risk factors.<sup>17</sup> A population over 35 years of age has increased susceptibility, not solely on age but due to changes relative to the ageing process.<sup>18</sup> All papers contain a mean age greater than 35, therefore, it is questionable whether any positive or negative results can be extrapolated to the wider population.

## Exposure

The application of glycine powder was consistent across all papers except paper one which allowed subjects to be exposed twice, at baseline and three months. Comparing the results of paper one, there were expectations of enhanced reductions in PPDs, similar to papers two and three, which measure the same outcome. Upon analysis this is untrue, presenting only slight reduction of PPDs and an increase at six months, whereas papers two and three show reductions from one exposure only. However the results of paper three, indicating enhanced reductions, have reduced validity as the study design allowed two five-second exposures as opposed to one five-second. This additional exposure is contradictory of manufacturer's instructions therefore uncovering ethical concerns of non-maleficence.<sup>10</sup> Yet contrary to this, no adverse reactions or complications were reported and, as results have shown a positive reduction, changes to the application of exposure may need to be reviewed. From these results, paper two presents as the most valid showing a true reflection of the exposure's efficacy.

Total bacterial counts present similar trends, with paper one indicating initial positive reductions, yet after three months bacterial counts increased dramatically. Papers two, five and six all received one exposure, allowing true comparison of results. Although statistical significance was given, the clinical significance of paper two is uncertain due to the low difference between results. Papers five and six highlight substantial reductions in bacterial counts, although limited data fails to provide full understanding of these results. Both these trials were also conducted by the same author who, although stated no conflicting interest, was the inventor of the glycine powder. This information must introduce bias to the work lowering validity of the results.

When individual bacteria Pg, Tf and Aa were assessed, papers two, three and four all agree and demonstrate reductions of Pg. Tf was shown to be reduced in papers three and four, with the latter being the only trial to demonstrate a reduction of Aa. As discussed previously, paper three highlights issues of validity over results due to the additional exposure. Yet all results have shown favourable reductions of sites present with bacteria responsible for PD.

## Outcome

The measurements of PPDs were taken with justified and reliable measurement tools: papers one and three both use manual probes, Williams Probe paper one, Hu Friedy PCP15 Probe paper three; paper two used a computerised instrument, Florida Probe. Such instruments measure the depth of periodontal pockets in millimetres to create a detailed analysis of the periodontium.<sup>19</sup>

All plaque samples were collected from subgingival sites. Papers one and three both use a Gracey Curette which is confirmed as a reliable method of collecting plaque samples obtaining a higher bacterial load than paper points, the measurement tool of papers two, four, five and six.<sup>20</sup>

Regardless of whether samples were taken for total bacterial count or individual species the examiner should remain impartial and blinded to the trial to reduce performance bias.<sup>13</sup> In these studies, papers one, five and six all used an external blinded examiner to enhance validity of the results; paper one specifying clinical recordings were taken by the same calibrated examiner with a Pearson's positive linear efficiency correlation of 0.901 aiding the validity of measurements taken.<sup>21</sup> However paper two, three and four omitted any external or blind examiners, which infers a level of measurement bias.

Following plaque sampling all collections were analysed, papers one and three both use a validated checkerboard DNA-DNA hybridisation technique.<sup>22</sup> All other papers use a real time polymerase chain reaction (PCR) to detect total bacterial count as well as individual species, a technique equal to the checkerboard DNA hybridisation technique.<sup>23</sup> All papers have been proven to use tested analysis methods therefore internal validity remains intact.

With the aim of the research question being to evaluate an exposure, not comparing with control groups, statistical methods used to compare such intergroup differences becomes negated. For the purpose of defining statistical significance with *p*-values of specific dependant variables, methods such as a Bonferroni and t-test is exemplified in all papers, reducing probabilities of obtaining false results by equating multiple data.<sup>24</sup>

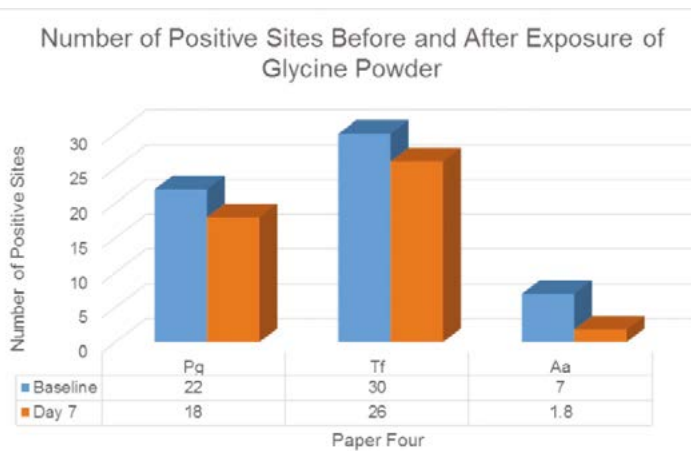


Figure 9 : Number of Positive Sites for Pg,Tf and Aa

## Relevance to practice

The results highlight a surprising correlation between microbial analysis and PPDs. As known, it is the metabolic activity of bacteria which create collagenase and hyaluronidase to break down junctional epithelium allowing the PPD to migrate apically to the long axis of the tooth. Theorising glycine powder had the ability to reduce PPD by inhibiting the stimulation of macrophages correlates with the results from this review.

Although bacterial counts have shown to reduce, the remaining bacteria may recolonise causing an associated host response furthering progression of PD. Furthermore, there is plausibility that bacteria may become resistant and mature to avoid elimination. In paper one, bacterial counts increase post three months, in contrast to the other papers which report favourable reductions at three months. Continually Aa, Pg and Tf all show positive declines within a short period post exposure, therefore reducing any association of continual PD related with these bacteria.

On the available evidence exposure into practice needs careful consideration. This review has approved a beneficial use of glycine powder as a viable method to remove subgingival bacteria and lower PPD. Efficacy has been shown to be favourable, with speed of application being superior to conventional therapy resulting in shorter appointment times, beneficial to both patient and clinician. All papers concluded high safety apart from paper two which reported patients suffering minor gastrointestinal disorders.

## Conclusion

This appears to be a viable method of reducing subgingival biofilm and PPDs, although careful deliberation of cost and appointment length must be addressed prior to implementation in practice. Based on such analysis, with high levels of safety, patient satisfaction, efficacy and potential profits this treatment may be recommended to patients.

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This is a summary of the Systematic Review conducted for a third year dissertation, a full copy may be obtainable through request via email: [hilsonpaul91@gmail.com](mailto:hilsonpaul91@gmail.com)

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# Self Assessment for CPD

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## PAPER 1: EVALUATING A ONE HOUR RESILIENCY WORKSHOP DELIVERED TO DENTAL HYGIENE AND DENTAL THERAPY STUDENTS: A PILOT STUDY PP6-9

### 1. In this pilot study, how many Dental Hygiene and Therapy students were invited to answer the first questionnaire?

- A. 32
- B. 45
- C. 72
- D. 75

### 2. In this pilot study, what was the purpose of following the first questionnaire with a one-hour workshop a week later?

- A. The timing would benefit students prior to their end of year assessments
- B. The timing would immediately benefit students in their clinical work
- C. The timing would significantly improve their general health
- D. The timing would raise their awareness of stress as a debilitating mindset

### 3. Which of the following statements is false?

- A. The same questionnaire was administered three weeks later, following the workshop
- B. The students were required to participate in all parts of the study
- C. The workshop aimed to provide information about the nature of stress and well-being
- D. The workshop aimed to raise awareness of stress as a coping mechanism to build resiliency

### 4. Which of the following statements is false?

- A. The response rate for the pre- and post-workshop survey was 72% (n=52) and 43% (n=31) respectively
- B. The mean age of study participants was 27 years
- C. Participants reported having much higher self-compassion after attendance at the workshop than before attending.
- D. The results revealed no improvement in the sub-scale of manageability

### 5. Which of the following statements is false?

- A. Participants reported a positive shift in pre- and post-workshop scores in all measures
- B. The workshop, workbook and questionnaire produced a positive effect in the way DHDTS understood stress
- C. Participants showed a significant positive shift in scores for self-compassion after attending the workshop
- D. Recent qualitative research found that DHDTS were very self-critical about their own performance

### 6. Which of the following statements is false?

- A. It has been shown that those individuals who have self-compassion, are more likely to be compassionate towards other people
- B. The participants reported very low levels of stress as enhancing mindset, and high stress as debilitating mindset
- C. The participants reported a significant increase in scores that measured the extent to which they were able to manage a challenging situation on their own
- D. This study showed positive physical changes in the way the students understood stress

## PAPER 2: A DIRECT COMPARISON OF TWO INTERDENTAL CLEANING DEVICES ON CLINICAL SIGNS OF INFLAMMATION: A FOUR-WEEK RANDOMISED CONTROLLED TRIAL PP10-15

### 1. How many participants took part in this study?

- A. Seven
- B. Seventeen
- C. Seventy
- D. One hundred and seventy

### 2. What is a water flosser?

- A. PTFE fibre dipped in water
- B. A single-use tool that comes pre-strung with a short section of floss
- C. A hand held device that utilises air under pressure
- D. A power driven device that produces a pulsating stream of water under pressure

### 3. What three clinical parameters were recorded during this study?

- A. Modified Gingival Index, Bleeding on Probing and Rustogi Modification of the Navy Plaque Index
- B. Bleeding on Probing, Modified Gingival Index and Oral Hygiene Index
- C. Russell Periodontal Index, Rustogi Modification of the Navy Plaque Index, Gingival Bleeding Index
- D. Bleeding on Probing, Modified Gingival Index and Debris Index

### 4. When were participants asked to use the interdental device?

- A. Twice a day, morning and night after toothbrushing
- B. Once a day in the evening after toothbrushing
- C. Once a day in the morning after toothbrushing
- D. Once a day in the evening before toothbrushing

### 5. Which of the following is true?

- A. The AFP group was 60% less effective than the WF group for reducing whole mouth MGI
- B. The WF group was at least 50% more effective than the AFP group for reducing BOP at WF
- C. The WF group was 51% more effective than the AFP group in reducing plaque scores in proximal areas
- D. All of the above

### 6. Which of the following statements is false?

- A. A water flosser is less effective than an air flosser in reducing clinical signs of inflammation
- B. An air flosser is less effective than a water flosser in reducing clinical signs of inflammation
- C. A water flosser is more effective than an air flosser in reducing plaque
- D. An air flosser is less effective than a water flosser in reducing plaque

# Self Assessment for CPD

## PAPER 3: WORKING WITH PATIENTS AND THE PUBLIC TO DEVELOP DEMENTIA FRIENDLY ORAL HEALTH TOOLS PPI 6-21

### 1. In the UK, how many people are estimated to currently suffer from dementia?

- A. 8,500
- B. 85,000
- C. 850,000
- D. 8,500,000

### 2. What percentage of the residents in care homes are living with dementia?

- A. 90%
- B. 80%
- C. 70%
- D. 60%

### 3. As reported by the wives with husbands suffering from dementia, what is a common barrier to cleaning teeth?

- A. Refusal to engage in the task
- B. Pride and dementia
- C. Time constraint
- D. All of the above

### 4. What is the most common challenge faced by the wives with husbands suffering from dementia?

- A. Depression
- B. Dementia
- C. End of life
- D. All of the above

### 5. Which of these statements is false?

- A. Dementia patients are predictable and their behaviour does not change.
- B. Carers can experience significant levels of emotional stress and physical burden from the demands of caring for a family member with dementia.
- C. The impact of dementia on residential care is demanding and regular oral hygiene care provision is described as challenging for the cognitively impaired resident.
- D. There are examples of aggression and agitation associated with dementia and associated barriers to providing mouth care.

### 6. What factor could improve visits by dementia patients to the dental practice?

- A. Dementia friendly notes
- B. Better access to dental care professionals
- C. Step by step picture guides of oral health instructions
- D. All of the above

## PAPER 4: KIDSFABRIEK: ORAL HEALTH AWARENESS AND PROMOTION OF ORAL SELF-CARE DURING A LEARNING AND PLAY EVENT FOR CHILDREN AND PARENTS IN THE NETHERLANDS PP22-25

### 1. What is the oral health event which forms part of *Kidsfabriek*?

- A. A group short-term approach oral health programme to be used by oral health professionals in practice and primary schools.
- B. A programme implemented by 'Ivoren Kruis' (Ivory Cross), a Dutch society for the promotion of oral health.
- C. An individual long-term approach oral health programme to be used by oral health professionals in practice and primary schools.
- D. A voluntary initiative set up by dental hygienists focusing on oral health awareness and intentional behavioural change.

### 2. In the 2014 *Kidsfabriek* event what was the frequency noted that children brushed their teeth?

- A. Never
- B. Once a day
- C. Twice a day
- D. Three times a day

### 3. What percentage of parent and carer respondents, in the 2015 *Kidsfabriek* event, considered that it was unimportant to limit the child's intake of sugary foods and drinks?

- A. 10.6%
- B. 12.6%
- C. 13.6%
- D. 18.6%

### 4. In the 2015 *Kidsfabriek* event, what percentage of parents and carers reported they were aware that toothbrushing should be performed at least one hour after exposure to acidic soft drinks?

- A. 65.2%
- B. 34.8%
- C. 18.2%
- D. 10.6%

### 5. In 2015, how many of the 66 parents visited a dental hygienist twice a year?

- A. 3
- B. 15
- C. 18
- D. 30

### 6. In the 2016 *Kidsfabriek* event, what percentage of children DID NOT want to visit a dental/oral hygienist

- A. 25.0%
- B. 24.1%
- C. 19.4%
- D. None

PAPER 5: PUBLIC AWARENESS AND KNOWLEDGE OF THE ORAL HEALTH THERAPY PROFESSION IN SINGAPORE PP26-31

**1. Which of the following was the chosen method for the collection of data for the Singapore study?**

- A. Telephone survey
- B. Survey form
- C. Face to face survey questionnaire
- D. Dental practice questionnaires

**2. What year did the first cohort of students enrol in the Diploma of Dental Therapy at Nanyang Polytechnic?**

- A. 1983
- B. 1996
- C. 2001
- D. 2003

**3. Which country pioneered the development of the dental therapy profession?**

- A. Singapore
- B. New Zealand
- C. Australia
- D. United Kingdom

**4. In 2016 how many Oral Health Therapists were practising in Singapore?**

- A. 145
- B. 245
- C. 401
- D. 445

**5. What do the initials DHBS stand for?**

- A. Dental Hygienist Belief Survey
- B. Dental Health Belief Survey
- C. Dental Hygiene Belief Survey
- D. Dental Hypnosis Belief Survey

**6. The Singapore study demonstrated that the general public's knowledge and awareness of the OHT profession in Singapore was...?**

- A. High
- B. Low
- C. Non-existent
- D. Improving

PAPER 6: DOES GLYCINE POWDER IMPACT ON CLINICAL ATTACHMENT LEVELS AND SUBGINGIVAL BIOFILM IN ADULTS WITH PERIODONTAL DISEASE? A SYSTEMATIC REVIEW SUMMARY PP32-36

**1. In which decade were air polishing devices introduced?**

- A. 1940s
- B. 1950s
- C. 1960s
- D. 1970s

**2. Which of the following powders were first used for air polishing?**

- A. Sodium bicarbonate
- B. Sodium salicylate
- C. Sodium carbonate
- D. Erythritol

**3. Which of the following statements is false?**

- A. Glycine is a naturally occurring amino acid, nontoxic and water soluble
- B. Glycine is considered to be anti-inflammatory
- C. Glycine particle sizes are up to four times smaller than NaHCO<sub>3</sub>
- D. Glycine has a particle size of 250 μm.

**4. In this review, which of the following outcomes were not measured?**

- A. Clinical attachment levels
- B. Periodontal pocket depths
- C. Biofilm bacteria levels
- D. Bleeding on probing

**5. How many papers were identified and how many are subsequently reviewed?**

- A. 26 and 6
- B. 20 and 6
- C. 16 and 6
- D. 14 and 6

**6. Which of the following statements is false?**

- A. Glycine powder appears to be a viable method of removing subgingival bacteria
- B. Glycine powder appears to reduce periodontal pocket depths
- C. All papers reviewed confirmed Glycine powder presents no side-effects for patients
- D. All papers reviewed show positive declines in Aa, Pg and Tf within a short period post exposure



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