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Title page and affiliations

When chefs adopt a school?: an evaluation of a cooking intervention in English primary schools.

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Abstract

This article sets out the findings from research on the impact of a, UK based, chefs in schools teaching programme on food, provenance, health, nutrition and cookery. Professional chefs link with local schools, where they deliver up to three sessions to one class over a year.

The research measured the impact of a standardised intervention package and changes in food preparation and consumption as well as measuring cooking confidence. The target group was 9 -11 year olds in four schools. The main data collection method was a questionnaire delivered two weeks before the intervention and two weeks afterwards. There was a group of four matched control schools.

Those taking part in the intervention were enthused and engaged by the sessions and the impact measures indicated an intention to change. There were gains in skills and confidence to prepare and ask for the ingredients to be purchased for use in the home. Following the session with the chef, the average reported cooking confidence score increased from 3.09 to 3.35 (by 0.26 points) in the intervention group - a statistically significant improvement. In the control group this change was not statistically significant. Children's average reported vegetable consumption increased after the session with the chef, with the consumption score increasing from 2.24 to 2.46 points (0.22 points) again, a statistically significant increase with no significant changes in the control group.

The research highlights the need to incorporate evaluation into school cooking initiatives as the findings can provide valuable information necessary to fine-tune interventions and to ensure consistency of the healthy eating messages.

Key words

Cooking, vegetable consumption, cooking confidence, culinary nutrition

Introduction

This article outlines research on the impact of chefs going into schools to teach children to prepare and taste healthy food. The programme is run by the UK based Academy of Culinary Arts' Chefs Adopt a School Scheme (see www.academyofculinaryarts.org.uk for more details). In the Chefs Adopt a School Scheme (CAAS), professional chefs link with local schools, usually primary, where they deliver three sessions to a class each year, the first class covers healthy eating and flavours and taste, the second deals with practical food preparation and the third where possible, consists of a visit to a restaurant. Core elements included in all sessions are hygiene and health, an appreciation of food through the senses, particularly, taste and practical cooking/food preparation. The programme's aim is to teach children about food, food provenance, healthy eating and food preparation. At present, sessions are provided all over England subject to demand and resources (with a few sessions being delivered in Scotland). Annually, 21,000 children take part in the initiative. The programme is similar to the Cooking Matters programme in the US (<http://cookingmatters.org/>), which has been running for over thirty years and was formerly known as 'Share our Strength'. The main difference is the dose of the interventions, with the US programme offering 10 sessions as compared to the three in the UK based programme. Another key difference is that the US programme is jointly delivered by a dietician and a chef (see Condrasky and Helger 2010; Condrasky, *et al*, 2010). There are many examples of local schools linking with local restaurants or chefs; what are distinctive are the extent and scale of the Chefs Adopt a School Scheme and the focus on taste and gastronomy. The CAAS programme was originally developed to raise awareness of catering as a career to school children. Since its inception the intervention has grown organically and with variations in delivery from area to area and chef to chef, this research describes the evaluation of an existing intervention with a focus on the healthy eating messages being delivered.

In many UK public health programmes cooking plays an important part of programme interventions (Wrieden *et al*, 2007, Caraher and Cowburn, 2004; Caraher and Dowler, 2007). The various cooking initiatives in the UK have had over £30 million pounds spent on them in the period 2008-2011 (Caraher and Seeley, 2010), without any rigorous evaluation (Caraher, 2012). de Sa and Lock (2007) in their review of school based programmes identified that cooking and tasting sessions were among the ways to help increase the intake of fruit and vegetables. There have been numerous calls for the re-introduction of home economics into schools as a means of addressing chronic diseases through encouraging the choice of healthy options, more fruit and vegetable consumption and the use of healthy cooking options (Lichtenstein and Ludwig, 2010; Vileisis, 2008).

While there is limited evidence that cooking initiatives can help people cope and make healthier choices the literature is sparse and mostly descriptive and not evaluative (Rees *et al*, 2012; Chen *et al*, 2012). Here we seek to address some of these issues by applying the lessons learned from the literature review of teaching cooking to children (Seeley, Wu and Caraher 2010)

Methodology

Systematic review

A systematic review of the existing literature on cooking in schools was undertaken, this informed the evaluation design (Seeley, Wu and Caraher 2010). There were four levels of quality based on the methodological quality of evidence provided, these were:

Level 1: A well-designed study, survey or systematic review, using randomised, controlled, quasi-experimental, intervention versus a control and comparison group or a pre-and post-test design including historical studies with academic rigour.

Level 2: A study, survey, case study or review of cooking in schools.

Level 3: Descriptive/anecdotal, well presented and relevant qualitative information.

Level 4: Very general information with little data but with subject relevance.

A major finding from this review was that there were few well-designed or evaluated studies in existence. There were a few community and adult based interventions but these were excluded as the focus was not young people or schools (eg Wrieden et al, 2007; see Rees et al, 2012 for a systematic review of cooking for adults). In essence four of high quality were identified (Liquori, Koch, Contento & Castle, 1998; Townsend, Johns, Shilts & Farfan-Ramirez, 2006; Perez-Rodrigo & Aranceta, 1997; Cullen, Watson, Zakeri, Baranowski & Baranowski, 2007).

The only intervention to be ranked as a level one study was one that delivered a mix of food and environment lessons (theory based), practical cooking sessions, parental involvement and provision of plant-based foods at school lunch (Liquori, Koch, Contento & Castle, 1998). The remaining three met the level 2 standard of the review. One of these, based in the United States of America, was a randomised control trial of an intervention over 6–8 weeks for low-income youth consisting of food tasting, fruit and vegetable preparation as well as other activities (Townsend, Johns, Shilts & Farfan-Ramirez, 2006). The other was a one group cohort, ‘before and after’ intervention that targeted ‘gypsy’ children in Bilbao, Spain involving school-teachers, nutritionists and catering staff (Perez-Rodrigo & Aranceta, 1997). The final study was an interactive computer based intervention, based on social cognitive theory, where pupils ‘virtually’ prepared a fruit juice or vegetable recipe on a computer program and then prepared recipes for ‘homework’ in their home kitchen (Cullen, et al 2007). The results demonstrated an increase in post-test consumption although this was associated with baseline consumption, suggesting an impact on the already committed.

The findings from the review informed the structure and design of this study. There is much activity on cooking and young people in the community or school setting but much of the literature is at best descriptive (Seeley, Wu and Caraher 2010) and few measured cooking confidence, although many of the articles talked about this as a concept. This research was carried out at a time when cooking in schools was being put forward as a solution to improving diets and reducing obesity (Lichtenstein and Ludwig, 2010; Caraher and Seeley

2010). Many primary schools do not teach hands on cooking so the CAAS program fills a gap and helps compensate for the shortage of nutritionists and home economists in the UK (Caraher and Seeley 2010).

Research Design

The research design was quasi-experimental, for each school in the intervention group a similar school was matched for geographical region and Free School Meal Entitlement (FSME) ¹ at the school level was included in the control group. Schools in the control group were scheduled to receive a Chefs Adopt a School session in the following academic year, and were therefore delayed intervention schools. The sample comprised two groups of children in years 4 and 5 (with an age range of 9-11 years) at primary school in England.

Questionnaire design and piloting

Initially some sessions were observed by the researchers to help inform the methodology. Session delivery style varied between chefs and was individual, often adapted to suit schools different needs, curriculum focus and/or facilities available. Core aspects of the CAAS programme that all chefs deliver include: hygiene, healthy eating, taste testing and exploring where on the tongue students taste different flavours, as well as practical food preparation session. Some standardisation of session content was necessary for the evaluation. Chefs involved in the programme were consulted regarding a suitable recipe that included at least three vegetables and which could be made irrespective of cooking facilities. The chefs decided upon a vegetable pasta salad, where they agreed on five vegetables to be included (tomatoes, cucumber, celery, peas and red pepper). The focus was on use of these vegetables in the salad. We did not seek to increase consumption of any of them as vegetable or legumes on their own. Vegetables such as cucumber in the UK setting are more likely to be included as components of dish such as salad as opposed to being eaten on their own or as part of a pickle.

The questionnaire was designed in consultation with chefs, teachers, children, research staff and an international expert reference group. This latter group was comprised of eight academic members with expertise in practical cooking interventions. Feedback from consultation and piloting informed the final questionnaire design. Questions were included to collect data on attitude to the session and cooking generally, vegetable consumption, confidence asking for foods and ingredients at home and hand washing habits during food preparation. The final draft of the questionnaire was piloted twice over two weeks with 22 eleven year olds from a school in London. The pilot provided an opportunity to consult with prospective participants and an opportunity to test the reliability of the questionnaire. The correlation coefficients were relatively high: for hand washing behaviour it was 0.88; cooking confidence was 0.71 and asking confidence was 0.85 respectively. This means that the second time pupils filled in the questionnaire, their answers were similar (reasonably correlated) to the first, for all sections except for the fennel question. A correlation coefficient of 1.0 would indicate that all children gave the same answer to a question the second time. The correlation coefficients were relatively high for the main outcome measures, ranging from 0.71 to 0.88. Amendments were

made to the questionnaire as a result of this pilot. When using an instrument for evaluation with groups of children, an instrument is considered sufficiently sensitive and reliable at the 0.6 level (Carmines and Zeller, 1979).

The questionnaire did not directly ask children whether they had prepared a pasta salad at home as this may have encouraged children to conform to perceived expectations. Therefore questions regarding confidence at asking for specific foods in the home environment and when shopping were included in the questionnaire to assess possible transference eating behaviour into the home environment. The questionnaire included a section on a mystery vegetable (fennel) to assess whether the tasting part of the session encouraged children to try new, unfamiliar foods. As the session also focuses on hygiene in the kitchen, questions were asked regarding children's hand washing habits during food preparation, these are not reported in this paper.

Standardisation of delivery

The core delivery was two sessions: Session 1 covered hand washing, healthy eating and experiencing food through the senses, with a focus on taste. Session 2 was a recap of the hygiene followed by a practical cooking session. Children in school year groups 4 and 5 (ages 9-11 years) were chosen as the target, as our literature review, described above, suggested practical cooking sessions were found to have a greater impact on the cooking confidence of older primary school children. This was agreed with Academy of Culinary Arts and the chefs who deliver the sessions.

As stated previously the programme was developed over a period of years without aims and objectives, unlike those interventions outlined in the systematic review. The research remit was to evaluate an existing intervention, standardisation of sessions was limited to what was included in the menu and the study did not control for variations in delivery or personal styles of teaching, although we did measure and ask for feedback on these elements of the programme.

Sampling and sample size

Eleven schools were approached to take part in the evaluation. Two schools from the intervention group were excluded from the final analysis; one because the sessions were being delivered as part of a healthy eating week and the other because a different dish was made by the chef. Finally a school in the control group was not included because it had a low free school meal entitlement (FSME) compared to the intervention group that it was to be matched with. As a result of these exclusions the sample size was reduced to 4 comparable schools in each group. Schools were based in the North West (near Manchester and Liverpool), Midlands, West London and East London. The control school in East London differed in free school meal entitlement.¹ In the control group 70 per cent of pupils were entitled to a free school meal compared to 41 per cent in the intervention school. It is generally recognised that free school meal entitlement is higher in some areas in London and therefore it was decided to keep it in the study (London Economics, 2008).

A minimum sample size of 63 children in each group was calculated as necessary to detect a difference of half (0.5) a standard deviation (SD) in self-efficacy score, with 80 per cent power. In the Liquori paper the standard deviation for cooking confidence score was = 0.28 ((Liquori, Koch, Contento & Castle, 1998). Each school provided two comparable sub-samples which ultimately provided 169 participants: 86 pupils in the intervention group and 83 pupils in the control (delayed intervention) group. Each subsample was comprised of four classes of approximately 20 pupils. Details of the sample are presented in Table 1 below.

Table 1: Sample demographics

Data collection

Baseline data was collected using a questionnaire, in the week before the scheduled session (T1) with the chef. Post intervention data was collected two to four weeks following the session with the chef (T2). The data from the control schools was collected at parallel time points. The only difference in the questionnaires was that the ones administered to the intervention schools post intervention contained questions on the running of the sessions, the presentation style of the chefs and attitude to the session with the chef.

Cooking confidence

Questions regarding food preparation were used as a proxy to measure confidence in specific skills required for simple food preparation. The children were asked how confident they were in four key cooking tasks: cutting fruit and vegetables, measuring ingredients, following recipe instructions and making a pasta salad. Cooking confidence was measured using a scale, where 1='I can't do this at all', 2= 'I need a little help', 3='I need a lot of help', and 4='I can do this on my own' (based on Liquori *et al*, 1998). These questions were asked of children in both the intervention and control groups pre and post intervention.

Vegetable consumption

Vegetable consumption was measured using a scale where 1 – ate it more than once, 2- I ate it once, 3- I did not eat it but I wanted to, 4 – I did not eat it and did not want to. The consumption of the vegetables in the pasta salad were used as a proxy for overall vegetable consumption. To cross check information given against school meal provision we asked them whether they had eaten the vegetables at home, in their lunch box and/or in their school lunch. We then asked the catering manager whether each of the five vegetables had been provided as part of the school lunch in the week prior to the questionnaire administration.

Confidence in asking for favourite vegetable

Confidence in asking for a favourite vegetable at a mealtime was tested. This was measured using a scale 1 – can't do this at all, 2- I'm not sure about doing this, 3- I can do this.

Ethical clearance was applied for and approved by the Ethical Committee at City University, London.

Data and statistical tests

SPSS v 16 was used to analyse all the data. After initially analysis it was noted that there was potential for confusion because significant baseline differences existed between groups. For example at baseline 82 per cent of the intervention cohort were confident as measured by the ability to follow a recipe unaided or with a little guidance compared with 94 per cent of the control cohort were confident. Post intervention 91 per cent of the cohort was confident as measured by the ability to follow a recipe unaided or with a little guidance compared to 93 per cent of the control cohort, Figure 1. The differences between the cohort abilities at baseline were significant as measured by a comparison of mean scores. For this reason we chose to only test pre and post intervention data in the intervention group.

The magnitude of changes in cooking confidence and vegetable consumption the intervention group between the two points in time was compared using a paired t-test. Although intake of particular vegetables are not normally distributed the actual changes in consumption were, hence a parametric test was appropriate. A $P < 0.05$ was considered statistically significant.

The change in confidence in asking for favourite vegetable were measured using the McNemar test. We group the responses into confident (1) or not confident (2 & 3).

Results

Findings are presented under the headings: attitude to session; cooking practice related to individual skills; cooking confidence; vegetable consumption; openness to trying and asking for new foods and finally a short section on free school meal entitlement and cooking confidence is included. For the purpose of this paper the scope of our reporting will focus on cooking confidence, vegetable consumption and confidence asking for ingredients, we therefore exclude data on hygiene, hand washing and food handling.

Attitude to the sessions

This part of the questionnaire was designed to find out about the pupil's attitude to the session and satisfaction levels with the learning and teaching approaches. Out of the 86 children who answered this part of the questionnaire, 89 per cent wanted to have another session with the chef so they could make more dishes and cook more or to taste new foods and flavours and nearly half of the sample enjoyed meeting the chef. Only five children said they did not want another class with the chef.

The children reported enjoying tasting new food (76%); making a new dish (66%); learning new cutting skills with fruit and vegetables (48%) with only 2 per cent reporting they didn't enjoy any of these things.

Changes in individual skills

Children were asked to what extent, when preparing food, they felt able to cut up fruit and vegetables, follow recipe instructions, measure ingredients and make a pasta salad. When asked before the sessions with the chef

if they could 'cut up fruit or vegetables', 63 per cent of children in the intervention group said they could do this 'on my own' compared with 83 per cent of children in the control group (see figure 1). So the two groups were not the same at baseline. Post-test, the proportion of children who said they could cut fruit and vegetables on their own increased by 10 per cent to 73 per cent in the intervention group and by 3 per cent in the control group. The number of children in the intervention group who could not cut up fruit and vegetables without help fell from 5 per cent to 0 per cent in the intervention group and 4 per cent to 1 per cent in the control group.

At baseline, the two groups were significantly different in their reported ability to follow recipe instructions. In the control group, 60 per cent of children said they were able to follow recipe instructions 'on my own', while 46 per cent in the intervention group had the same confidence level. Within the intervention group, those who said they could not follow recipe instructions 'at all' fell from 9 per cent to 1 per cent at post-test, while a small increase was observed in the control group, from 1 per cent to 2 per cent. At baseline and post-test, the differences between groups in measuring ingredients were not statistically significant. Within the intervention group, the largest change from pre- to post-test occurred in the proportion of children who said they 'need a little help', which increased from 34 per cent to 44 per cent at post-test. Also in the intervention group, those who said they could not measure ingredients at all fell from 13 per cent to 6 per cent at post-test.

At baseline, the differences between groups in reported ability to make pasta salad were not statistically significant. Post intervention, the proportion of children who reported being able to make a pasta salad by themselves more than doubled in the intervention group, from 26 per cent at baseline to 54 per cent post-test (see Figure 1). In the control group, this proportion remained the same at 37 per cent. While self reported confidence changed in both the intervention and control groups, post-test proportions did not differ significantly.

Figure 1: Combined percentages of children who reported being able to do an activity either alone or with a little help

Figure 1 shows changes in both groups pre- and post- intervention, combining those who said they were able to do activities on their own with those who needed a little help. Within groups, the largest pre- to post-test change occurred in children's confidence in making pasta salad, with gains in both the intervention and control groups, though a larger change was seen in the intervention group.

Cooking confidence score

The test of cooking confidence score in the intervention group pre and post intervention (tables 2, 3 and figure 2) indicated that after the intervention the cooking confidence of the children increased. This increase was statistically significant at the 95 per cent confidence limit (<0.001) (CI -0.25 – 0.10) indicating that the Chef's Adopt a School Programme had a significant impact on the cooking confidence of the children who took part in the programme (see Table 2 below).

The cooking confidence score in the control group pre and post intervention (Table 3) indicated that in the same time period the cooking confidence of the child increased ($p=0.02$), the confidence interval was 0.75 – 0.07 indicating that this increase was likely to be due to chance.

Table 2: Paired sample t-test to evaluate the impact of the Cooks Adopt a School course on students' confidence in food preparation and impact on vegetable consumption (in the 2-4 weeks after intervention)

Table 3: Paired sample t-test for control group students' confidence in food preparation and impact on vegetable consumption (in the 2-4 weeks after intervention)

Figure 2: Cooking confidence score change pre to post intervention ($n=169$)

Vegetable consumption patterns

Consumption questions related to the five vegetables included in the pasta salad. These were cucumbers; tomatoes, celery, peas and red peppers. The results show that the control and intervention groups were significantly different (consumption of all vegetables, with the exception of red pepper, was higher in control than in intervention children) at baseline. The only vegetable children in the control group reported eating more of after the chef sessions was cucumber, no changes in consumption were seen in the control group(s).

The change in vegetable consumption in the intervention group post intervention was significant ($p=0.002$, CI 0.01-0.18) indicating that there was a real change in the vegetable consumption pattern in the weeks post intervention (see Table 2). In contrast the difference in vegetable consumption in the control group (see Table 3) was not significant ($p=0.08$, CI -0.07- 0.52) indicating that the change was due to chance.

Figure 3: All vegetable consumption ($n=169$) combining the percentage of children who reported eating the vegetables once and more than once in the past week pre and post intervention for both groups.

Asking confidence

Children were asked whether they felt able to ask a parent or carer to buy the ingredients for a pasta salad, favourite sweets, the ingredients for a pasta salad, pick out a favourite fruit or vegetable when shopping and ask for a favourite fruit or vegetable dish at home. At baseline more children in the control group who reported that they could ask their parent or carer to buy ingredients for a pasta salad than in the intervention group (81% versus 51%, respectively). The percentage of children in the intervention group who reported that they could ask a parent or carer at home to buy the ingredients for a pasta salad increased by from 51 per cent to 73 per cent post intervention. The changes observed in asking confidence were statistically significant in the intervention group ($p<0.001$). Conversely the number of children who felt either unsure or unable to do this halved – from 49 per cent to 24 per cent post intervention.

At baseline, a greater proportion of children in the control group reported that they felt able to ask their parent or carer to buy sweets compared to the intervention group (90% versus 70%, respectively). The changes in the intervention reported in asking confidence were not statistically significant following the session with the chef. We asked this to check if increased confidence in asking for foods transferred to less healthy foods.

Figure 3: Confidence to ask for favourite vegetable for supper (n=169)

Impact of Free School Meal Entitlement on cooking confidence

We noted that there appeared to be a relationship between cooking confidence and the percentage of free school meals at the school level. Free school meal entitlement appeared to be inversely related to the magnitude of change in cooking confidence in pupils who received the intervention. However, without knowing individual pupil's FSME status it is impossible to draw conclusions regarding this association, we based our sample on school rates not individual entitlement to free school meals. This was not tested as it was outside the parameters of our study and we did not have the data on individual pupils free school meal entitlement to carry out a mediation analysis as our data was at the school level. We highlight this issue for future research.

Discussion

The data collected revealed that the key aspects children enjoyed about the session were tasting new foods and flavours, making a new dish, learning about new foods, learning and practicing new food preparation skills and meeting the chef. So 'novelty' value played an important part of the delivery. Overall the session with the chef motivated children to report wanting to cook a lot or a bit more. In particular the children seemed to enjoyed having a chef (rather than a teacher) delivering the session. While a positive attitude is essential to mediate changes in behaviour, it is worth noting that previous research has found that attitude itself does not necessarily translate into behaviour changes and the latter is harder to achieve than the former. This is illustrated by the lower yet consistent changes in reported consumption seen in this research compared with the increases in skills and confidence. So the issue is not just to address risk factors but risk outcomes (Rose, 1992). We only measured reported outcomes two to six weeks after the intervention and not long-term outcomes. In line with other health promotion interventions, it may be that while the sessions are useful in starting children to engage with food other supportive interventions need to support this initial stimulus and any initial behaviour changes.

The findings highlight the need to incorporate evaluation into school cooking initiatives, as findings provide valuable information necessary to fine-tune an intervention. The intervention as it currently exists is akin to what Condrasky and Helger (2010) call '*culinary nutrition*' where nutrition and issues related to food taste and preparation occur side-by-side. Although as pointed out in the introduction the distinction between the Chefs Adopt a School intervention and others such as the US Cooking Matters is that the UK programme is delivered with only a chef and a limited number of sessions without any formal dietetic or home economics input. This raises issues of the correctness and consistency of the nutrition message (Fordyce-Voorham, 2011). The

reasons for this are a lack of trained home economists in the UK (Caraher, 2012). Therefore, there are clearly lessons for the overall cohesiveness of the programme and the consistency of message. One way of addressing this is by linking the intervention to other food initiatives in the school such as School Nutrition Action Groups and the World Health Organization whole school approach (Stewart-Brown, 2006). This would ensure a fit within the health activities of the school and also ensure that there is a link to wider issues of food education and choice. For consistency of measurement we standardised the intervention and to some extent controlled the health messages to be delivered. We had noted in our observations of classes prior to the intervention and in piloting the questionnaire that the chefs tended to highlight what was of interest to them and some gave inconsistent messages about healthy eating.

The small dose of the intervention (two sessions) did bring about changes in the intervention group. The devised cooking confidence scores represent an average score as an aggregation of measurements of four different skill sets. For two of these skill sets (cutting up vegetables and making pasta salad), average changes in confidence were significant. However for measuring ingredients and following recipe instructions, the confidence changes were not significant. Our observations of the classroom sessions indicated that the children in the intervention did follow instructions from the chef; however, they did not follow recipe instructions in a linear manner from start to finish instead using them as guides or templates. So it is not surprising that there was no significant change in confidence for following recipe instructions. The reported increase in confidence almost doubled in the intervention group this may be just because participants feel they should know how to make a pasta salad after making it with the chef in the session. The percentage of children who felt they could make pasta salad by themselves or with a little help showed an increase in both the intervention and control group post intervention (58% to 82% in the intervention group compared to 65 to 81% in the control group). Based on children being able to make pasta salad on their own, however, the difference in confidence between the groups post intervention was significant, which suggests that the session with the chef had an impact on children's cooking confidence.

The large size of the groups (20+), combined with the small dose left the children somewhat frustrated. This may also be because one session is not enough for them to gain new skills, so there was little opportunity for them to work independently. This could be addressed by having the sessions jointly delivered by a chef and nutritionist/home economist to ensure more individual attention. On a positive note children responded positively to having the session delivered by a chef, the novelty of a chef and the current public fascination with celebrity chefs probably helped in this respect (Hansen, 2008; Caraher, Baker and Burns, 2004; Caraher, Lang and Dixon, 2000). It is clear from the feedback, from the children, that they were engaged and eager to learn new cooking skills and taste new foods. Even the pupils who stated that the sessions did not make them want to cook more or that they did not like cooking reported wanting more opportunities to practice new skills, taste new foods and have a visit from the chef again.

The change score demonstrated a statistically significant increase in reported overall vegetable consumption in the intervention group (+0.22) which was not observed in the control group (-0.30) suggesting the session with

the chef did have a positive impact on –reported-eating behaviour in the short term. Post intervention data was collected 2-4 weeks after the session with the chef so, while not long-term, the data does seem to indicate an impact on eating behaviour. The increased consumption observed in the intervention could be due to the intervention taking place during summer term when salad vegetables (tomato, cucumber, celery and red pepper) are in season and widely available. However, there were no significant increases in consumption of any vegetables in the control group which would be expected if this was the case. Long-term follow up (at least six months post intervention) would be needed to ascertain whether this change in consumption is sustained.

Two high quality papers identified in the literature review adopted the whole school approach (Liquori et al 1998; Perez Rodrigo et al 1997). These interventions, similarly to the US Cooking Matters programme, also had more sessions than the current intervention-generally between 6 to 10 sessions. Future evaluations of school-based initiatives should take this factor into account as previous research (de Sa and Lock, 2007) has found an association between exposure and consumption. This is part of the whole school approach that other school food initiatives adopt. To maximise the impact of the sessions delivered by the chef ways of combining the messages with the wider school curriculum and food practices could be explored. Our current research only measured the impact following the interventions not any long-term outcomes.

Also of interest from the analysis is that 20 pupils out of 86 reported no change and 15 reported a negative change in cooking confidence after having the session with the chef. This may well be due to the small dose of the intervention. If pupils have little experience of practical cooking skills, one session may increase average confidence; however more sessions are likely to be needed to have a positive impact on confidence for more children from all areas. One practical cooking session may impact negatively on children's cooking confidence if they are inexperienced (which is likely for some 9-11 year olds). For children who reported a loss in cooking skills, the session may have served to make them aware of their inexperience and lack of skills. It may be that more sessions would be needed addressing different skills and food preparation techniques to increase these children's confidence. Conversely it may be that children who had some experience of practical food preparation or cooking had their confidence reinforced and increased by the cooking sessions.

The trend for pupils from deprived areas, based on FSME data, achieving a lower cooking confidence was only observed in the intervention group and indicated a significant association between free school meal entitlement of school and intervention. It may be that children's confidence was reduced when, during the practical session they realised the skill level needed to prepare and cook dishes and recognised they were yet to achieve this. Similarly the session may have caused them to draw comparisons with cooking at home, where it is possible that due to poor food access, low income and/or a lack of cooking skills, meals are not prepared from fresh ingredients. Without measuring free school meal entitlement on an individual basis and relating to the individual outcomes it is impossible to reach firm conclusions regarding this association. This is an area for future research and is necessary to ensure that this and similar programmes do not widen inequalities.

The significant association between intervention and confidence relating to vegetables alone or as an ingredient may indicate that despite the dose being small, its focus on vegetables resulted in specific outcome: increased asking confidence in the home environment. This may signify transference of attitude that could translate into eating behaviour to the home environment. When children were asked if about their confidence asking for ingredients for a pasta salad at home or to pick out the ingredients themselves while shopping, increases in confidence were high at +22 per cent and +23 per cent post intervention respectively. While the latter was not significant, it is of note. The increases were similar though and in fact more children were happy to pick out ingredients for a pasta salad in the supermarket (82% post intervention) compared to those who felt they could ask a parent to buy the ingredients for the pasta salad (73%).

The findings indicate that a short-term changes in cooking confidence and consumption was achieved, whether this change will be sustained is unclear. The Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI-Centre) recommends (based on their systematic review findings) that any promotion of fruit and vegetables in schools needs to be based on a whole school approach (Thomas et al, 2003). Further, the systematic review that informed this evaluation details interventions that included the whole school approach. The whole school approach includes food provided at lunchtime and break times, parental involvement, cooking and taste testing as well as exposure and learning. This was not a feature of the current research as we wanted to control the impact of such factors and our focus was on measuring the impact of the intervention independently of such factors.

Regarding reliability, it is worth noting that this was high, i.e. pupils gave consistent answers when the questionnaire was piloted. It is also possible that they gave answers that they saw other pupils giving because data was collected in the classroom setting and that the answers they gave may not have reflected consumption and cooking confidence. Ideally interviews regarding consumption, using the 24 hour recall method would reduce error. However, this was not possible within the evaluation budget and timescales there is also some debate as to the usefulness of such measures with children. We cannot explain the increase in confidence in the control group. It is possible that answering the questions at baseline familiarised the children with the terms, so that the second time they filled in the questionnaire they recognised the questions and dishes and therefore felt more confident about making them or even answering the question itself. There were to the best of our knowledge no specific television or media attention on cooking during the period of the intervention.

Conclusions

The practical cooking intervention dose of the intervention was small, but nonetheless significant changes in cooking confidence, vegetable consumption and asking confidence indicates that even small scale interventions may have a short-term impact. Follow up would be necessary to assess whether such changes are sustained.

It is impressive that the programme had impact on children's cooking confidence, eating behaviour and confidence to ask for foods at home. Future iterations of the programme should focus on:

- Ensuring consistency of message and linking culinary, food safety/handling messages with nutrition ones.
- Explore the possibility of linking chefs, home economists and dieticians as in the US Cooking Matters programme.
- Include handling & tasting of foods prepared and allowing kids to take home the food to make a school/home link (Cullen, et al 2007).
- Linking the CAAS programme with school catering, food and curriculum content to maximise impact, as in a whole school approach as set out by WHO (Stewart-Brown, 2006; Thomas et al, 2003). While a small number of sessions may not be ideal by linking with other initiatives there are opportunities to maximise the potential impact.

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Conflict of interest

None

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^{1.} In the UK free school meal entitlement refers to the percentage of pupils in a school who are eligible for free school meals funded by their Local Authority, because they are from low income homes usually on state benefits.

Table 1: Sample demographics Show column for ‘n’ and column for percentage?

	Control n=83	Intervention n=86
Gender (%)		
Girl	41%	49%
Boy	59%	50%
East London	31%	23%
West London	23%	22%
North West		
England	19%	28%
Midlands	27%	27%
FSME		
East London	70%	41%
West London	23%	20%
North West		
England	56%	51%
Midlands	7%	13%
Geographical setting		
	Inner	
East London	city	Inner city
West London	Urban	Urban
North West		
England	Urban	Urban
Midlands	Urban	Urban

Figure 1: Combined percentages of children who reported being able to do an activity either alone or with a little help

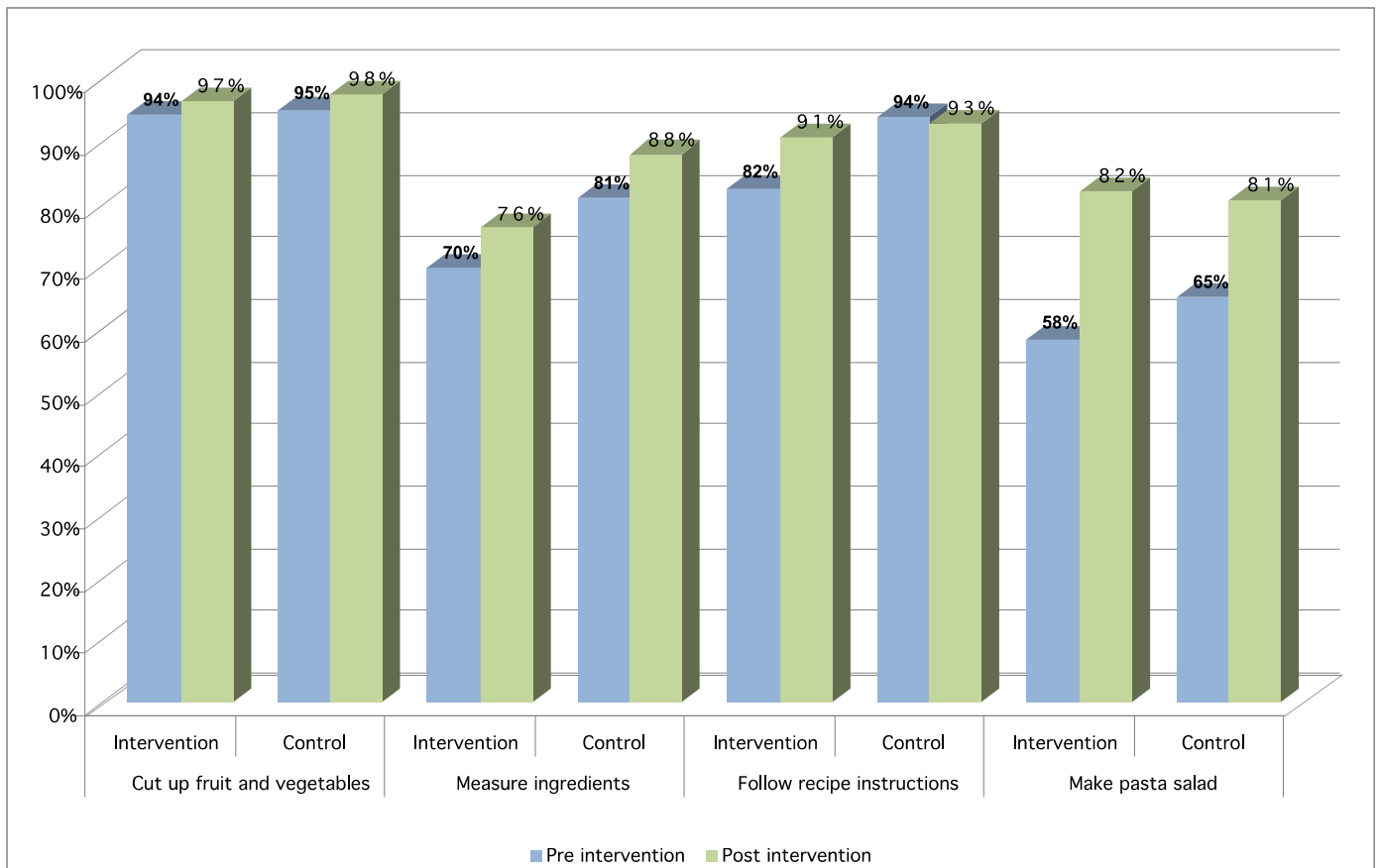


Figure 2: Cooking confidence score change pre to post intervention ($n=169$)

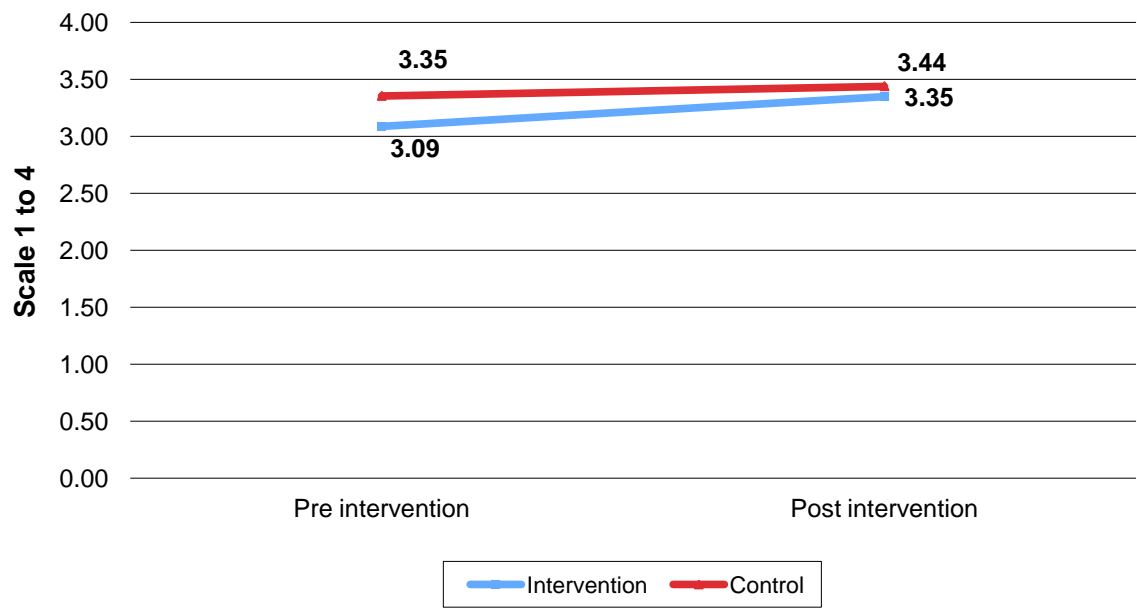


Figure 3: All vegetable consumption (n=169) combining the percentage of children who reported eating the vegetables once and more than once in the past week pre and post intervention for both groups.

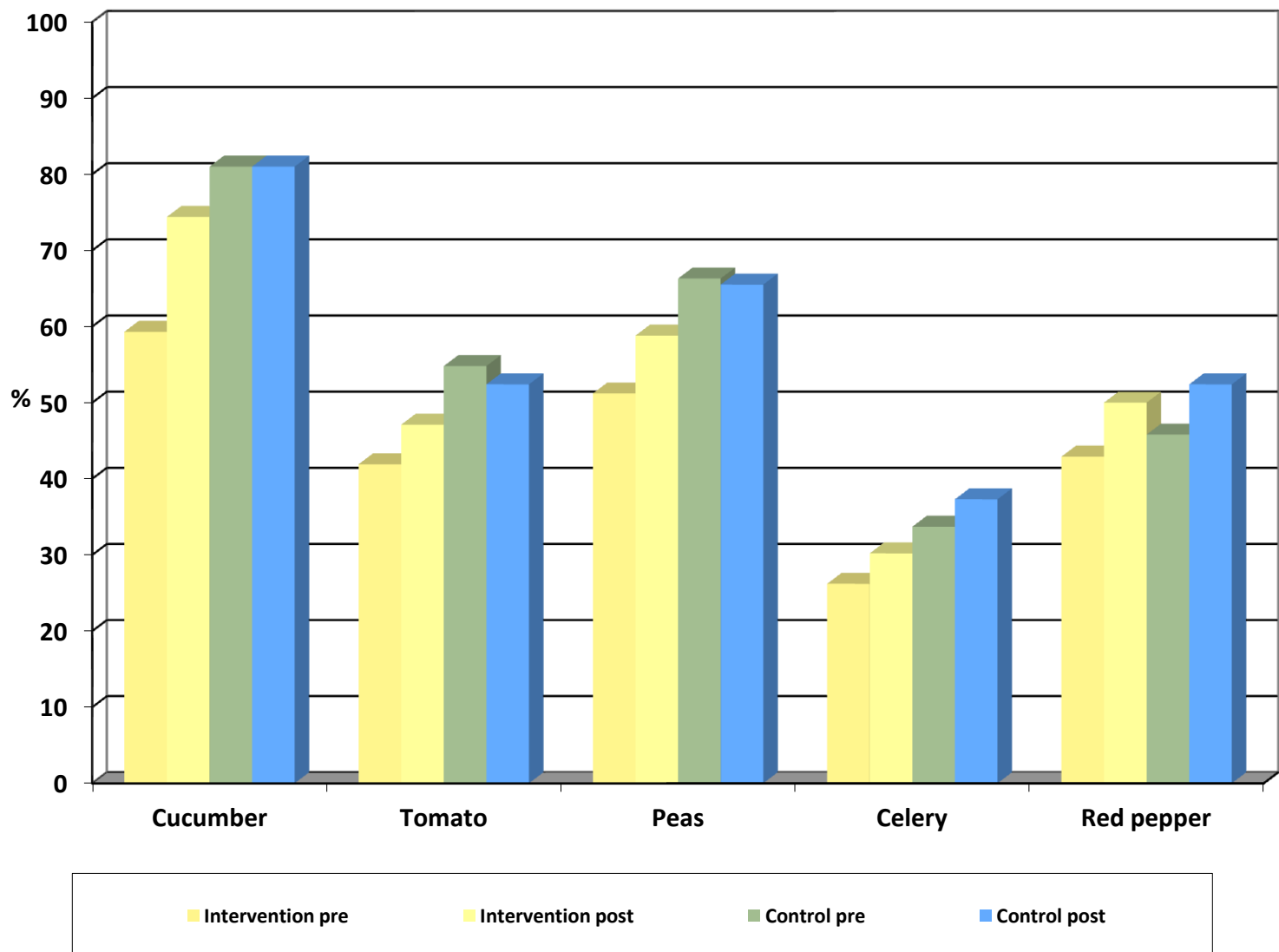


Table 2: Paired sample t-test to evaluate the impact of the Cooks Adopt a School course on students' confidence in food preparation and impact on vegetable consumption (in the 2-4 weeks after intervention)

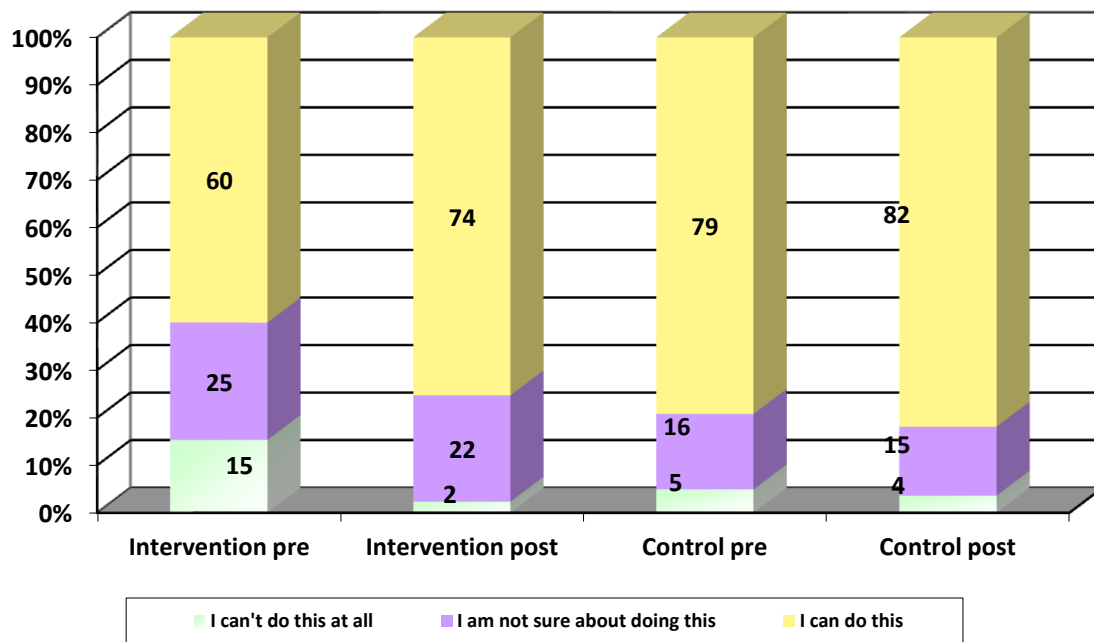
	Intervention Cooking confidence	Intervention vegetable consumption (2-4 weeks post intervention)
Mean	-0.18	0.09
Standard deviation	0.50	0.57
CI Minimum	-0.25	0.01
CI Maximum	-0.10	0.18
Df	161	160
N	81	81
Significance (2 tailed)	0.000**	0.002**

** P-value is the difference in the means is significant

Table 3: Paired sample t-test for control group on students' confidence in food preparation and impact on vegetable consumption (in the 2-4 weeks after intervention)

	Control Cooking confidence	Control vegetable consumption (2-4 weeks post intervention)
Mean	0.41	0.076
Standard deviation	1.53	2.64
CI Minimum	-0.75	-0.07
CI Maximum	-0.07	0.52
df	80	78
N	81	79
Significance (2 tailed)	0.02	0.80

Figure 4: Confidence to ask for favourite vegetable for supper ($n=169$)



Appendix Sample of questions from the questionnaire

Attitude to session with chef

Tell us what you like about the lessons you did with the chef...(tick as many as you agree with)

- | | |
|--|---|
| <input type="checkbox"/> Meeting a chef | <input type="checkbox"/> Learning about new foods |
| <input type="checkbox"/> Tasting new foods | <input type="checkbox"/> Making a dish |
| <input type="checkbox"/> Practising using a knife to cut fruit/veg | <input type="checkbox"/> None of the above |

Is there any anything else you liked about the lessons with the chef? _____

If you were the chef is there anything you would have done differently in the lesson?

What other things would you liked to have done in the session? _____

Did the lesson make you want to help with cooking more often?

- | | |
|---|---|
| <input type="checkbox"/> Yes, I want to cook a lot more | <input type="checkbox"/> Yes, I want to cook a bit more |
| <input type="checkbox"/> No, not really | <input type="checkbox"/> No, I don't like cooking |

Would you like to have another session with the chef? ☐ Yes ☐ no (please tick)

If you answered yes please tell us why you would like another session with the chef?

Is there anything else you would like to tell us about food and cooking?

Cooking Confidence questions

If you are preparing food, can you (please draw a circle around the face that tells us about you)....

Cut up fruit or vegetables



I can do this on my own



I need a little help



I need a lot of help



I can't do it at all

Follow recipe instructions



I can do this on my own



I need a little help



I need a lot of help



I can't do it at all

Measure ingredients



I can do this on my own



I need a little help



I need a lot of help



I can't do it at all

Make a pasta salad



I can do this on my own



I need a little help



I need a lot of help



I can't do it at all

Questions relating to exposure and provision of foods

If you ate any of the above vegetables where did you eat them (draw a cross through the pictures that tell us about you)? :

Cucumber



In your school lunch



In your lunchbox



At home

Tomato



In your school lunch



In your lunchbox



At home

Peas



In your school lunch



In you lunchbox



At home

Celery



In your school lunch



In your lunchbox



At home

Red pepper



In your school lunch



In your lunchbox



At home