Factors influencing hand washing behaviour in primary schools: process evaluation within a randomized controlled trial

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Received on October 10, 2011; accepted on April 2, 2012

Abstract

This article explores factors that may influence hand washing behaviour among pupils and staff in primary schools. A qualitative process evaluation within a cluster randomized controlled trial included pupil focus groups (n = 16, aged 6–11 years), semi-structured interviews (n = 16 teachers) and observations of hand washing facilities (n = 57). Pupils and staff in intervention and control schools demonstrated a similar level of understanding of how, when and why they should wash their hands. Lack of time, poor adult modelling of regular hand washing and unattractive facilities were seen as important barriers to regular hand washing. Reminders and explanations for the importance of hand hygiene were thought to have a positive impact. Influencing individual choices about hand washing through education and information may be necessary, but not sufficient, for initiating and maintaining good hand washing practices. Structural factors, including having time to wash hands using accessible, clean facilities, and being encouraged through the existence of hand washing opportunities in the daily routine and hand washing being viewed as the social norm, will also influence hand washing behaviour. The effectiveness of educational interventions at improving hand hygiene in primary schools may be improved by changing priorities of staff and increasing accessibility to quality facilities.

Introduction

Good hand hygiene is an important infection control measure as person-to-person contact, including via hands, is a common mode of transmission for gastrointestinal and respiratory infections [1]. Half of all general practitioner consultations, and 12% of all hospitalizations among children aged 0–14 years are for infections [2]. Respiratory infections and infectious intestinal disease are responsible for 48 and 29% of primary care consultations among this age group, respectively [2]. In primary schools in England, 5 days are lost due to sickness per teacher per year [3], and pupils are absent due to illness for 3.7% of the sessions that they should attend [4], although it is not known how many of these are due to infections. Hand hygiene is important in primary schools to prevent the spread of infectious illnesses, and is a key infection control measure recommended during pandemic influenza [5]. Improving hand hygiene to lower the transmission of infections could reduce absenteeism of teachers and pupils in schools, and could also potentially prevent secondary infections in the wider community, reduce health service costs and lower the burden on families, some of whom may need to take time off work to care for children.

Meta-analyses have shown that hand hygiene educational interventions, particularly the use of non-antibacterial soap with education, can be effective in preventing gastrointestinal and respiratory illness [6], although this review was not focused...
specifically on primary school settings. However, this review, and two others focussing on developing countries [7, 8], have drawn attention to the lack of rigorously conducted randomized controlled trials (RCTs) to evaluate the effectiveness of hand washing interventions in preventing the spread of respiratory and gastrointestinal infections.

Educational interventions to promote hand washing in school settings aim to improve knowledge and awareness about healthy hand hygiene to reduce the spread of infections and have been associated with reduced absenteeism [9, 10] and gastrointestinal infections [11], and increased compliance with hand washing [12, 13]. An individual, or agent, may be more likely to wash their hands when they understand why and how to do it. Patterns of health-promoting behaviour, however, are not merely products of independent individuals [14]. Individual choices about healthy lifestyles fit into a structural scheme grounded in group behaviour and social interaction [15] and are not always rational or autonomous. Individuals may have control over their choices, but not over the conditions, or structures, in which these choices are made [16]. These structural factors determine what choices are realistically most likely to be operationalized and made routine [17]. This article uses data from a process evaluation embedded within a cluster randomized trial testing the effectiveness of a hand washing intervention to explore agency and structural factors that may influence hand washing behaviour among pupils and staff in primary schools.

**Methods**

**‘Hands up for Max!’ hand hygiene study**

The ‘Hands up for Max!’ hand hygiene study is a cluster randomized trial to determine whether an educational resource intervention to promote hand washing is effective in reducing absenteeism among pupils and staff in primary schools. All state primary schools (n = 613) within six local authorities in the South West of England were invited to participate in the study. Participating schools (n = 178) were randomized to receive the intervention in 2009 (intervention schools) or to receive the resource after all follow-up data were collected in 2011 (control schools). The ‘Hands up for Max!’ resource was developed by the Health Protection Agency (HPA) as a low-cost educational intervention that could be readily integrated into existing school curricula. It had been subject to formative evaluation and refined during its development by the HPA and the final version used in the trial included a 6-min CD-ROM or DVD animation teaching how to wash hands correctly, lesson plans exploring ‘What are germs?’ and ‘Healthy hands, healthy school’, A4 posters demonstrating how to wash hands correctly, and stickers for pupils. Routine absence data will be used to assess the primary outcome of the number of half days of pupil absence from school at baseline and post intervention. Within the main trial, 24 schools (12 intervention and 12 control) were randomly selected to be part of a sub-study in which collection of enhanced data on staff and pupil absenteeism will examine infection-related absence. The study was approved by the University of Bristol Faculty of Medicine and Dentistry Committee for Ethics.

**Process evaluation**

The process evaluation within this trial was designed to collect data on hand washing facilities, knowledge, attitudes and behaviours related to hand washing, and how the intervention was implemented and received across schools. Four intervention and four control schools in the sub-study were purposively selected within the strata of school size (large or small) and eligibility for free school meals (high or low). Large school size was defined as those with more than 194 pupils. Schools with high eligibility for free school meals had more than 6.4% of pupils eligible. Data collected in the process evaluation are listed in Table I.

**Focus groups with pupils**

Focus groups were conducted with pupils from one lower Key Stage 2 (KS2) class (ages 7–9 years) and one upper KS2 class (ages 9–11 years) in each of the eight schools, except for one school where the...
younger focus group was conducted with Key Stage 1 (KS1) pupils aged 6–7 years. This group was treated as lower KS2 for analysis purposes. Pupils were randomly selected from those in the class whose parents had consented to them participating. Occasionally, pupils participating in the focus group represented all those who had returned their parental consent forms, or were selected by the teacher in which case the basis for selection was unknown. Focus groups took place during school hours in a variety of settings, including classrooms and libraries, depending on room availability. The mean duration of the 16 focus groups was 35 min (range 19–52 min), with three to seven pupils per group. Focus groups explored pupils’ views on hand washing facilities in the school, and their thoughts on barriers and facilitators to good hand washing. Pupils were asked to draw a picture of a place where they washed their hands. This activity was included to provide a break from the discussion, and help elucidate data related to what children thought was important about hand washing facilities [18, 19].

### Interviews with teachers

Semi-structured interviews were conducted with two teachers (one KS1, one KS2) at each school to explore their views, knowledge and attitudes about hand hygiene and hand washing facilities in the school. The mean duration of the 16 interviews was 14 min (range 9–24 min).

### Direct observation

Observation checklists were used to document the facilities available for hand washing in classrooms and staff and pupil toilets. Checklists included information on the number of sinks with hot or warm water and soap and hand drying facilities available. The observer also used a five-point scale to rate how clean the area looked (1 = unacceptable, 5 = spotless) and smelled (1 = foul/putrid, 3 = no smell, 5 = fresh/fragrant). Photographs of hand washing facilities were also used to inform analyses but are not presented because of the risk of identifying schools.

### Analysis

Digital recordings of focus groups and interviews were transcribed verbatim. Each transcript was checked for accuracy by the researcher who conducted the focus group or interview. Atlas.ti and Stata version 11 were used to aid the data organization and analyses.

A conceptual framework was used to classify and organize data [20], which included topics and subtopics that were deductively derived from issues introduced in the focus group and interview topic guides. Within these subtopics, codes were created based on recurring accounts and descriptions that were identified in the transcripts and checklists. Two authors (A.N. and E.B.) independently reviewed an interview and focus group transcript and formulated codes. Codes across all subtopics were inductively sorted into potential themes and relevant data extracts were collated within identified themes [21, 22]. Thematic networks were constructed to facilitate the structuring, description and interpretation of the themes [22]. Within themes, case-ordered matrices were used whereby

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<th>Table I. Summary of data collected in the process evaluation</th>
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<td>Teacher interviews</td>
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*aDrawings were not used at one school where focus groups took place in an area with limited space that did not have tables.*
cases (interviews and focus groups) were ordered, for example, positively worded statements through to negatively worded statements, according to some variable of interest. This case-ordering enabled examination of differences across cases, for example, between teachers and pupils, or intervention and control schools [23]. Themes were built into an explanatory model [23] to demonstrate how various factors might influence hand washing behaviour (Fig. 1). This article focuses specifically on the thematic networks describing the factors that may influence hand washing behaviour and practices (Fig. 2). Views about the ‘Hands up for Max!’ educational intervention will be explored separately.

Results

Key findings are described below according to the main themes that emerged as having a potential influence on hand washing behaviour (Fig. 2). The factors within the thematic network can be viewed as being related to structural factors (time, facilities and societal norms) and agency (encouragement and reminders, education and information, awareness and knowledge). Differences between intervention and control schools, or teachers and pupils, were not observed unless specifically stated.

Time

Lack of time was reported as a reason for why pupils and teachers may not wash their hands properly, or at all.

I think time is a big barrier if people don’t get to feel like they have time then they don’t wash their hands thoroughly and...I’d say that's the biggest barrier. (ID104, Intervention KS1 teacher)

Pupils also reported having better things to do. This notion of competing priorities was supported by some teachers.

They just like “Do you want to go on the bikes?” and they forget...and then they can’t go and wash their hands. (ID123, Intervention lower KS2 focus group)

Fig. 1. Explanatory model of hand washing practices in the ‘Hands up for Max!’ study.
I think children rush in and out and they’re so keen to get out to play or to go and eat their dinner or whatever it is. (ID127, Control KS1 teacher)

Teachers were limited in the time they had available to wash their hands because they did not have opportunities to leave the classroom.

Well I mean for teachers I think it’s difficult because there’s very limited times when you can leave the classroom. (ID324, Control KS2 teacher)

Teachers noted that including hand washing as part of the routine, for example, before lunch, or after doing activities such as painting, ensured that
children washed their hands at key times during the day.

We tend to dedicate a certain amount of time for them getting ready for lunch 'cause they always have to wash their hands so lunch time is twelve o’clock so by about ten to twelve, five to twelve we’re ready and then they go in little groups to make sure they’ve all washed their hands. (ID127, Control KS1 teacher)

If ever we’re cooking it’s always planned into the lesson, children to wash their hands and talk about the importance of hygiene before they touch any of the ingredients. (ID303, Intervention KS1 teacher)

There was evidence that hand washing as part of the daily routine was more common among younger than older pupils, and that opportunities existed to make hand washing more of a routine.

Certainly KS1 are, have always been very, very hot [on hand washing]. I suppose at KS2 we tend to assume that the children... [wash their hands themselves]. (ID123, Intervention KS2 teacher)

We have two sittings, we have the school dinnerers who go first and are told ‘right go wash your hands then get in the line then I’ll check you and then I’ll take you in’ so they have to do that, whereas the packed lunches come in from the playground, grab their lunch and don’t necessarily go via the hand washing so I think there’s a time issue but there’s also a routine issue and... I think we need to build that in somehow or have a hand washing station or something. (ID127, Control KS2 teacher)

Facilities

Having attractive and clean facilities available was seen to encourage hand washing.

The toilets we use, the kind of key stage one toilets, they’re really nice you know attractive, clean, organised place to be not kind of like you think ‘oh I just want to get out of here as fast as possible’, it’s actually kind of a bit of a socialising place. (ID124, Control KS1 teacher)

Negative statements about the attractiveness and cleanliness of school hand washing facilities were more common among pupils (11/16 focus groups) than teachers (4/16 interviews).

Dirty! Dirty, they’re dirty, very dirty. (ID123, Intervention lower KS2 focus group)

This may be a result of some teachers not knowing the state of the pupil toilets because they do not enter them.

I’m not really sure for the pupils, I don’t really like going into their toilets so I don’t really know. I’ve never gone in long enough to examine. (ID122, Control KS1 teacher)

Data from observation of facilities indicated that none of the staff toilets looked or smelled bad (all scored 3 or higher on the five-point scale). Male pupil toilets were more likely to smell bad (3/16, 19%) than female pupil toilets (0/19).

Being able to easily access hand washing facilities may positively influence hand washing behaviour. Views on whether the number of hand washing facilities was sufficient varied within and across schools.

We have quite a few options so... they have access to washing their hands no matter what, when they’re out to play and when they’re in here before they go into lunch... it’s nice to have a rest room on the end of the classroom that kids can use all the time. (ID104, Intervention KS1 teacher)

It’s the space this year again, getting the children through, but the infants it’s much better ’cause they’ve all got individual toilets in their classrooms whereas we share this one and it’s a bit of a log jam and that’s difficult. (ID127, Control KS2 teacher)

I do think the biggest problem is probably the amount of toilets that schools have. Because
you know the students go out at half twelve
and if you’re busy with lessons and you don’t
think at ten past quarter past twelve oh I ought
to start sending them out now then you’ve got
whole class loads of children going to wash
their hands at twelve thirty. And you know
that’s a problem, takes too long. (ID122,
Control KS2 teacher)

The height of facilities was sometimes seen as a
barrier to hand washing.

In our class personally I don’t like the sink,
it’s too high so none of the children can really
wash their hands in class apart from the really
older few. (ID317, Intervention KS1 teacher)

One school was considering installation of auto-
matic light sensors to make hand washing facilities
in pupil toilets more accessible.

It depends who’s around them, it’s really dark
when you turn the light and shut the door be-
cause people do that. (ID317, Intervention
lower KS2 focus group)

Our children, our school council have asked
if we can have light sensors on in there
because at the moment we’ve got switches
which if you’ve got wet hands it’s not
really very safe but the sensors will turn
the lights on automatically and as soon
as we’ve got some money available…
we’ll do that because we think it’s really
important to speak to the children about
how they’d like to see things improved
and that’s something they’ve come up
with themselves. (ID317, Intervention KS2
teacher)

Soap was available in all toilet facilities, but at only
1/4 classroom sinks. Having nice soap available was
seen as a positive influence on hand washing.

What helps…certainly lower down the
school they’ve got foamy soap which they
really like, they use too much of but that it’s
just a…pleasant thing to do. (ID127, Control
KS2 teacher)

I like washing my hands in there be-
cause…there’s really good soap on your
hands. (ID104, Intervention lower KS2 focus
group)

Pupil A: The soap is not nice.
Pupil B: It’s jelly, I just use water. (ID324,
Control upper KS2 focus group)

Data from observation checklists indicated that
83% of facilities observed had hot and cold water
available at all washbasins or sinks. Nine facilities
(six pupil toilets, two staff toilets, one disabled
toilet) had only hot or cold water, not both, and
one washbasin in a pupil toilet area had no running
water. There was some discussion about the advan-
tages of turning or press down taps.

Pupil A: Push down taps stop, I prefer the
turning taps.
Pupil B: But twist taps get left on, push taps
are better.
Pupil C: In public toilets they stay on too short.
(ID324, Control upper KS2 focus group)

In our toilets at school we have taps which
turn off themselves automatically because if
you have to turn them off after you wash your
hands because you touch them before you
wash your hands you pick up the germs that
you had. (ID303, Intervention upper KS2
focus group)

Most facilities observed (91%), and all pupil toilets,
had paper towels or air dryers available for drying
hands. Participants stated that they liked automatic
dryers available in many public toilets, but ex-
pressed some concerns about hand dryers available
in schools.

One of the good things that I have found,
not in school at all, but just for myself in a
public place are those Dyson dryers where
you put your hands in vertically and come
out again. (ID122, Control lower KS2 focus
group)

We got a dryer but sometimes it doesn’t really
dry it. Yeah you have to stand there for like
two minutes or three minutes. (ID122, Control upper KS2 focus group)

The hand dryer’s a bit useless, very weak, isn’t it? Well you can’t ’cause you haven’t got time, so you don’t dry things thoroughly. (ID104, Intervention KS2 teacher)

Societal norms
Participants commonly (12/16 teacher interviews, 10/16 pupil focus groups) reported having seen people who did not wash their hands, or thought that people did not wash their hands properly, and did so in a tone which suggested disapproval of such behaviour.

I was in some public toilets recently in one of the big stores and I had to queue and the number of people that came out and just went straight out through the door. (ID122, Control KS2 teacher)

Pupil A: Some people go in the toilet and then pretend to turn the tap on in a way, like pretend to push it down but don’t actually put their hands under.
Pupil B: Or sometimes push it down then put their hands through really quick. (ID127, Control upper KS2 focus group)

I definitely have seen people who have used the rest room and then not washed their hands...I think...with the flu stuff going round people are taking a bit more seriously than they otherwise would but in general I don’t know if they always take it as seriously as they should. (ID104, Intervention KS1 teacher)

Encouragement and reminders
All of the teachers mentioned reminding pupils to wash their hands, and some thought that supervision improves hand washing practices.

With the little ones that are constantly reminded...’cause you see them come in straight after the cloakroom and you know you constantly have to say ‘Have you washed your hands?’ (ID127, Control KS1 teacher)

Having people supervise them while they’re washing their hands helps. (ID104, Intervention KS1 teacher)

Pupils in most focus groups (13/15) mentioned that their parents reminded them to wash their hands, although there were some instances where pupils stated that no one reminded them.

Before tea my mum goes ‘Oh go and wash’, because I forgot to wash my hands, I go wash them but I don’t always put soap all over them so she goes ‘Go and wash it again’. (ID124, Control upper KS2 focus group)

I just do it on my own. (ID122, Control lower KS2 focus group)

Most teachers (14/16) stated that they would tell children or pupils to wash their hands, but nine teachers noted that they would not tell other adults. Pupils in 15 focus groups said that they tell members of their family to wash their hands, and pupils in 8 focus groups (7 of these were upper KS2) said they tell other children or pupils to wash their hands.

Sometimes with the year three’s in a way because sometimes they just walk out and I say ‘Aren’t you going to wash your hands?’ and they go ‘No’ but then I go ‘Why, because it’s like you could have germs’ and then they go back and wash their hands. (ID127, Control upper KS2 focus group)

Seeing other people wash their hands was thought to have a positive influence on hand washing.

Adults can be a good example. (ID124, Control KS1 teacher)

All that you got to do is you got to do it yourself, if you can do it then they might copy you, so like well an adult might say, why ain’t we doing it ’cause they’re doing it, they might follow us. (ID104, Intervention upper KS2 focus group)
On some cartoons you know you never see them wash their hands so I think they should like wash their hands more in like cartoons because kids would just be thinking ‘Oh, like he don’t wash their hands so I don’t need to’ but like if they saw it on the TV they might think ‘Oh I need to do that’. (ID303, Intervention upper KS2 focus group)

Pupils in intervention schools (5/8 focus groups) were more likely than those in control schools (1/8 focus group) to report seeing family members wash their hands. This may reflect pupils exposed to the intervention being more aware of hand washing, and taking more notice when other people are washing their hands.

Posters reminding people to wash their hands, or how to wash their hands, were observed in 18/30 (60%) facilities in control schools and 12/27 (44%) facilities in intervention schools. Posters were more likely to be observed in pupil toilets (24/37, 65%) than staff toilets (3/11, 27%). Posters were seen as helpful visual reminders to wash hands.

I think posters and things around the school definitely helps and I know we’ve got some in sort of key areas but possibly not as widespread as sort of they could be. (ID124, Control KS1 teacher)

Education and information

Learning about the reasons why, and also how to wash hands was perceived as important in encouraging hand washing.

I think obviously with younger children you need to actually teach them the process of washing their hands and talk to them about the purpose of washing their hands…they don’t see the point so much really ‘cause I don’t think they understand necessarily what it could, you know, what could be spread. (ID127, Control KS1 teacher)

‘Cause they don’t know how to wash their hands, because they don’t know they have to. (ID317, Intervention lower KS2 focus group)

Tell them what will happen if they don’t wash their hands, with swine flu. (ID324, Control upper KS2 focus group)

Learning or teaching about hand washing was recalled in 13 focus groups and 11 interviews. Teaching about hand washing ranged from raising it as an issue within health and hygiene lessons, to more intensive programmes involving school councils.

Our topic in reception this term has been ‘How can I stay healthy?’ and it has been something like as well as…you know talking about their diet, brushing their teeth, washing hands has been something we’ve brought up with them as this is important you know. But we’ve not been involved in a program, not since I’ve been here. (ID124, Control KS1 teacher)

The School Council did a massive campaign on it, it must have been the last academic year and we had all of our toilets refurbished and it tied in really nicely with that so the children have had, not a campaign sounds like a really strong word, but they had class assembly and input from the School Council in the way of handouts and letters home and things like that…I think there was still posters up above the sinks that the children made themselves telling them to wash their hands. (ID303, Intervention KS1 teacher)

Teachers were asked whether they thought that schools were the right place to be teaching about hand washing. All teachers acknowledged the role that schools could play in teaching hand washing and encouraging good hand washing practices, although one teacher remarked that schools were given responsibility for an increasing number of issues.

Who knows ‘cause I think we’re given responsibility for absolutely everything in the
world... but if they’re not doing it properly and it helps people’s health and hygiene then. (ID104, Intervention KS2 teacher)

Seven teachers (two control, five intervention) thought that schools needed to be the main source of information about hand washing, whereas three teachers (two control, one intervention) felt that hand washing should start at home.

Yes, because we’ve got the children most of the day and they may well not be taught by their parents and some parents are not that aware of what their children are doing all the time. (ID324, Control KS1 teacher)

I think that obviously it should be embedded in the home first because when they come to school at four I think it should become an automatic that when they’ve been to the toilet they wash their hands and automatically that when you are going to eat you should wash your hands first. But unfortunately when they come to school we meet up with children that never ever had that input so they just follow along like sheep with the rest you know, so I don’t see where else you can input it really but in school. (ID122, Control KS2 teacher)

I think it should come from home but I think it’s really good that schools reinforce that message as well. (ID317, Intervention KS2 teacher)

Pupils also revealed that television and internet advertisements and programmes were sources of information about germs and hand washing.

And on TV, on CBeebies when I was little, I saw people and they washed their hands, they get rid of one germ at a time. (ID122, Control upper KS2 focus group)

They show on the telly the adverts about germs spreading. You could get, if you, if someone else is touch some, like a TV remote and you pick it up then you touch it, you could get their germs. (ID104, Intervention upper KS2 focus group)

**Awareness and knowledge**

Knowledge of the importance of washing hands to reduce the spread of germs was high among pupils, with this being mentioned in all focus groups.

If you get any germs it’ll get rid of them by washing your hands. (ID127, Control upper KS2 focus group)

If you don’t wash your hands and then you eat something then you might get all the germs and all the bugs. (ID303, Intervention KS1 focus group)

Understanding that hand washing was important to prevent people getting ill was also evident in most focus groups (six control, all intervention).

When you wash your hands it’s getting rid of germs that can make you ill (ID324, Control lower KS2 focus group)

If you wash your hands you get to do more learning in school, you get to join in a lot more things, ’cause if you are not well you can’t go outside. (ID104, Intervention upper KS2 focus group)

When asked to draw a place where they can wash their hands, pupils in intervention school focus groups (27%) were more likely than those in control schools (8%) to draw close-up pictures of hands. Examples of drawings that included hands or people washing their hands are shown in Fig. 3. Pupils in control schools (49%) were more likely than pupils in intervention schools (27%) to draw pictures that did not include people washing their hands or close-ups of hands. Images of germs appeared in more control school drawings (18%) than intervention school drawings (8%).

Good hand washing technique, as described in the ‘Hands up for Max!’ intervention materials, includes the following seven elements: removing watches or jewellery; running water at a comfortable temperature and getting hands all wet; using...
soap; rubbing hands together to make a lather; washing all over the hands, including palms, backs of hands, wrists, in between fingers, fingertips, and thumbs; rinsing; and drying hands. Pupils in 7/16 focus groups (four intervention, four control) and teachers in 7/16 interviews (five intervention, two control) mentioned five or more of these elements, or “the way that Max showed us” when they described good hand washing practices. Younger pupils were more likely than older pupils to include five or more of these elements in their focus group discussions (7/8 lower KS2, 1/8 upper KS2). Pupils in 8/16 focus groups (four intervention, four control) and teachers in 3/16 interviews (two intervention, one control) mentioned only one or two of these elements when they described good hand washing practices.

Knowing that they should, or reporting that they actually do, wash their hands after going to the toilet and before eating was evident in 15/16 focus groups and 15/16 teacher interviews. Reference to washing hands after coughing or sneezing was more common in control schools (7/8 focus groups, 5/8 interviews) than intervention schools (4/8 focus groups, 2/8 interviews).

**Discussion**

Qualitative data from this process evaluation within a trial has highlighted that agency, or influencing
individual choices about hand washing through education, may be necessary, but is probably not sufficient to ensure that good hand washing practices are initiated and maintained. Structural factors, including being provided with the time, opportunity and accessible, high quality facilities, also influence how likely hand washing becomes routine. This is consistent with previous research showing environmental changes enable improved hand washing behaviour [13, 24, 25]. Norms of social behaviour are also an integral structural component and are adopted and reproduced by individuals [15]. Being part of a structure where hand washing is demonstrated and promoted is likely to positively influence hand washing practices.

Pupils in control schools were at least as likely as pupils in intervention schools to understand when and how they should wash their hands, and that hand washing contributes to infection control. Close-up images of hands appeared in more intervention school drawings, indicating that pupils exposed to the educational intervention were more likely to associate a place where they wash their hands with the actual practice of hand washing. The 10 drawings by pupils in intervention schools that included such images, however, were clustered in two focus groups, suggesting that pupils could have copied each other’s ideas. Pupils in control schools were more likely to include images of germs in their drawings, consistent with their statements about reasons for hand washing.

Knowledge and awareness among pupils and staff at control schools is consistent with a previous study where primary school pupils demonstrated understanding of germs and hand hygiene [26] and may be due, at least in part, to all schools providing some information about hand hygiene, in lessons or via posters. This may be particularly relevant as the trial took place during an influenza pandemic, thus both control and intervention schools were receiving preventive infection control information. Even in the absence of an influenza pandemic, pupils and staff at schools with no specific educational intervention may still demonstrate good hand washing practices if the hand washing facilities are high quality, and hand washing is part of the daily school routine.

In addition to providing education and information, hand washing could be improved in schools by providing clean, attractive facilities with nice soap and effective hand drying options, as well as facilities in classrooms so that teachers and pupils do not need to leave the class to wash their hands. This may not be possible for existing schools, but could be considered when refurbishing or building new facilities. Involving pupils in the design or upgrade of facilities, particularly in schools where several different classes use the same facilities, may increase their sense of ownership and result in facilities being better looked after and more appealing to use. This process evaluation did not include any interviews with head teachers so the practicalities of providing high quality facilities within existing school budgets and priorities are unknown.

Gaining an understanding of what children and teachers think and know about hand washing, and the barriers they perceive that exist to prevent good hand washing practice, is necessary for implementing effective strategies to encourage them to wash their hands properly. Because this study was nested within a large cluster RCT we were able to purposively sample from a larger pool of schools to ensure that those schools included in the process evaluation were broadly representative. The in-depth nature of the data collection in these schools, and time-consuming nature of qualitative data analysis, however, meant that for practical reasons the total number of schools involved (four intervention and four control) was relatively small which may somewhat limit the external validity of the findings. Nevertheless, the qualitative methods used in this study were an effective mechanism by which to explore perceptions about hand washing. Focus groups enabled children as young as 6 years to contribute valuable information to the research process [27, 28]. Another strength of this study is that the process evaluation was conducted and analysed by a researcher not involved in the intervention delivery. In addition, as previously recommended [29], process evaluation analyses were conducted before the outcome evaluation, so key process factors likely to affect outcomes.
were not influenced by prior knowledge of trial results [30].

The educational intervention in this study may be successful in increasing knowledge and awareness about the spread of infection and hand hygiene through provision of education and information and visual and verbal reminders. This may not be sufficient to improve hand washing behaviour, and thus reduce spread of infections and absenteeism, in schools where facilities to wash hands are poor in both quality and quantity. Schools that provide opportunities for hand washing in terms of time and facilities, and that promote the importance of hand washing through information, setting good examples, and including hand washing in daily routines may have good hand washing practices irrespective of the presence of a specific educational intervention.

Acknowledgements

This work was undertaken with the support of The Centre for the Development and Evaluation of Complex Interventions for Public Health Improvement (DECIPHer), a UKCRC Public Health Research: Centre of Excellence. Funding from the British Heart Foundation, Cancer Research UK, Economic and Social Research Council (RES-590-28-0005), Medical Research Council, the Welsh Assembly Government and the Wellcome Trust (WT087640MA), under the auspices of the UK Clinical Research Collaboration, is gratefully acknowledged.

Funding

National Institute for Health Research (NIHR) under its Research for Patient Benefit (RfPB) Programme (PB-PG-1207-15212). The views expressed are those of the authors and not necessarily those of the NHS, the NIHR or the Department of Health. Australia Fellowship awarded to Professor John Lynch by the National Health and Medical Research Council of Australia (570120) [to C.R.C.].

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