



School-based, blacklight handwashing program can improve handwashing quality and knowledge among pre-school aged children

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ABSTRACT

In the United States, lack of proper handwashing is associated with respiratory and gastrointestinal illnesses. Interventions to improve handwashing practices have led to an increase in handwashing knowledge and behavior, and decreases in gastrointestinal illnesses. Most studies have evaluated their interventions in the context of reported handwashing rates by observation, reduction of illnesses, as well as reduced absences, however none of these studies examined handwashing quality or knowledge as outcome measures. The objective of this paper is to present the results from a handwashing program with a special focus on the evaluation methods.

A pre-post design was used to evaluate a handwashing program that took place in two pre-schools the northeast of the United States. The program utilized a black light technology to demonstrate to children the importance of good quality. The evaluation consisted of assessing knowledge and quality of handwashing using a linear puzzle and individual handwashing observation, respectively.

Students from both schools improved on both knowledge and quality over time (p-values 0.071 and < 0.001, respectively). The present study demonstrates that the use of black light technology as an educational tool may help to improve handwashing quality among pre-school aged children, even after only one instructional session.

1. Introduction

In the United States, lack of proper handwashing is associated with respiratory and gastrointestinal illnesses (Centers for Disease Control & Prevention, 2017). This is of special concern for preschool children (ages 3–4) who routinely touch their mouths and eyes with their hands. Without guidance on proper handwashing, children are more likely to become sick (Aiello, Coulborn, Perez, & Larson, 2008) and have excessive school absences, which can put them at an educational disadvantage. Interventions to improve handwashing practices have led to an increase in handwashing knowledge and behavior (Witta & Spencer, 2004) and decreases in gastrointestinal illnesses (Lau et al., 2012; Curtis and Cairncross, 2003)). Several handwashing studies have been conducted to look at the effectiveness of hand hygiene programs in elementary schools to reduce absenteeism among students using a variety of behavioral (visual cues and prompting of handwashing by teachers) (Gore & Lambert, 2001; Master, Hess-Longe, & Dickson, 1997; Snow, White, & Kim, 2008), instructional (tutorials on handwashing) (Morton & Schultz, 2004; Snow et al., 2008; Thompson, 2004) and environmental (posters, provision of soap/hand sanitizer) interventions

(Dyer, Shinder, & Shinder, 2000; Early et al., 1998; Gore & Lambert, 2001; Hammond, Ali, Fendler, Dolan, & Donovan, 2000; Thompson, 2004). These studies evaluated their interventions in the context of reported handwashing rates by observation, reduction of illnesses, and reduced absences, however none of these studies examined handwashing quality or handwashing knowledge as outcome measures in their evaluations. Work in developing country contexts has demonstrated that handwashing quality is an important aspect to consider in order to reduce the microbial contamination on hands (Amin et al., 2014; Fuls et al., 2008).

In September of 2017, the authors were approached by Essity, a global health company that sustainably develops, produces, markets and sells personal care and tissue products. Essity had created a handwashing program for pre-school aged students (3–4 years old) and asked the authors to conduct an independent evaluation of that program. Prior to the development of their program, Essity surveyed nurses in the School District and found that a plurality of nurses (35%) believed that pre-school students did not know the basics of handwashing. The school nurses and the School District supported the current proposed Essity-designed handwashing program as a means to reduce

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illnesses. The handwashing program for pre-school aged children was centered around using a blacklight technology that can visually demonstrate to children the importance of good quality handwashing. The blacklight technology has been used in health care settings as well as school settings to demonstrate improved handwashing practices (Fishbein, Tellez, Lin, Sullivan, & Groll, 2011; Morton & Schultz, 2004; Wiles, Roberts, & Schmidt, 2015). The objective of this paper is to present the results from the program with a special focus on the evaluation methods and tools used. The authors propose suggestions for moving forward in implementing and evaluating handwashing programs for very young children (i.e., pre-school, pre-k, kindergarten).

2. Methods

2.1. Program

The program, designed by Essity and simply titled “Handwashing Works,” was delivered to 10 classrooms (20 students/classroom) divided between two schools. The materials needed to conduct the program included 2 blacklight boxes, several bottles of “glow germs” hand lotion, extension cords (to power the boxes), hand soap and paper towels. Within the classroom, electrical outlets, tables and chairs and sinks were needed. All classrooms were equipped with a handwashing station in the classroom or with a bathroom that had a handwashing station (i.e. children did not need to leave the classroom to wash their hands). The program components – delivered in approximately one hour – included set up, introduction/education, handwashing activity with blacklight, and closure. After setting up the black light stations, the Essity team (4 staff) introduced themselves to the class and started the “Handwashing Works” lesson. For each lesson, the children were first prompted for answers, and then staff filled in the missing information, as follows: 1) Why is it important to wash hands? Staff would emphasize that bacteria and viruses (germs) make us sick. 2) No one wants to get sick, why? Staff would emphasize that if you had a cold you might not feel well or want to play with your friends. 3) When you sneeze, what do you do? The correct answer is sneezing into ones’ elbow. 4) What if you sneeze in your hand? Discuss spreading germs by touching things, and the importance of washing hands. 5) When should you wash your hands? This generated many answers, and staff emphasized before eating, after using the bathroom, after playing outside. Next the children are asked how they are supposed to wash their hands and the proper steps are taught. These were: wet your hands with warm water, use soap and rub it into your hands, wash for 20 seconds (e.g., while singing the happy birthday song 2 times), rinse with warm water and remove all soap, dry your hands with a paper towel. Children were taught that the paper towel helps remove bacteria. This instruction to use paper towels is based on the evidence that hand drying with one time use paper towels reduces the chance of bacteria dispersion seen with blow drying methods (Best & Redway, 2015). After reviewing what they had learned, students engaged in the handwashing activity as follows:

- The Essity instructor explained that they will practice washing their hands with some pretend dirt and germs. [The lotion (“Glow germs” is the pretend “dirt” and shows up when hands are held under the blacklight box; the goal of the activity is to teach the children to

remove all of the “dirt” when washing hands (quality of hand-washing).]

- The Essity instructor placed a small amount of the special “glow germs” lotion onto each child’s hands, calling it “dirt” and “germs” – and asks the children to rub it into their hands [when the lotion is rubbed in, it cannot be seen unless under the black light].
- Then, each child went to the blacklight box, one at a time, and put their hands under the light to see the dirt glow under the blacklight.
- Next, children were directed to the sink in the classroom to wash their hands with water and soap and to use a paper towel to clean off the “dirt.” They were told to use the four steps they just learned.
- After washing and drying their hands, they each returned to the UV light box, put their hands under the blacklight to see if they washed off all of the “dirt”. If they missed any, they could see they need to spend more time washing their hands. The Essity team would then explain that germs could still be on their hands. If there was time, children were allowed to re-wash their hands and try the blacklight again.

Students returned to their seats when the activity was complete and were congratulated for graduating “Handwashing School”. The Essity team then hung posters demonstrating handwashing steps in the classroom and by the sinks. The posters were placed in the same locations in each classroom. The goals of the program were to: 1. Increase knowledge on when and how to wash hands, and 2. Improve the quality of hand washing.

2.2. Research/evaluation design

The evaluation team was consulted after the School District agreed to the program, but before the program was implemented. The team worked with Essity to design an evaluation, however Essity was not involved in the analysis or interpretation of the results. Additionally, the evaluation team was not involved in the design of Essity’s hand-washing program. The initial evaluation design was a 2 × 2 wait- list control design without randomization. Essity had permission to conduct their program in 2 pre-schools which were self-contained (i.e., there were no other students besides the preschoolers that attended the school). After the evaluation team collected baseline outcome measures in both schools, the Essity program was implemented in school 1. Then the same outcomes were measured a second time in each school, after which school 2 received the program. A third assessment was taken, such that school 1 had a second follow up measure and school 2 had one follow up measure. In other words, school 1 had a 0X00 design and school 2 had a 00X0 design (see Table 1). This study design would allow for the second ‘delayed’ school to act as a control for the first school, and one would expect a change in handwashing quality and knowledge (outcomes) in the first school and no change in the control school – until they received the program. The program and evaluation took place over a period of five months from January to May 2018.

2.3. Participants and setting

The program was implemented in 2 pre-schools in a large, urban, school district in the Northeast United States. The first school had 6 classrooms and the second school had 4. Each classroom had 20

Table 1
Study Design.

	Baseline		Follow up 1		Follow up 2
Intervention School (6 classes; 20 students/class)	Outcome Measures	Hand washing program is delivered	Outcome measures		Outcome measures
Wait list School (4 classes; 20 students/class)	Outcome Measures		Outcome measures	Hand washing program is delivered	Outcome measures

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