

# Assessing The Effectiveness of Aversive Stimuli on Hand Hygiene. Compliance among Nursing Students during Clinical Postings: A Problem-Solving Approach in A Selected Nursing College of New Delhi

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## Abstract

**Background:** Hand hygiene plays a key role in breaking the chain of infection thereby reduces the incidence of cross-infection and healthcare-associated infections (HAIs). Improving hand hygiene compliance requires changing human behavior. By mentally associating unwashed hands with the feelings of disgust or discomfort, this conditioning promotes lasting improvements in compliance. Aversive stimuli are the unpleasant experiences that individuals naturally try to avoid and are often used to shape behavior. This can be an effective tool in promoting desirable behaviors. This study aims to assess the effectiveness of aversive stimulation hand hygiene compliance during clinical posting among nursing students of select Nursing College of New Delhi.

**Methods:** A quantitative, pre-experimental one-group pretest-post-test design was employed. Data were collected from 37 GNM students between May and June 2024 using a modified WHO hand hygiene observation checklist. Both descriptive and inferential statistical methods were applied to analyze the results. The finding shows that, before the intervention, majority—22 students (59.46%)—demonstrated very poor compliance, followed by 12 students (32.43%) with poor compliance and 3 students (8.11%) showing moderate compliance. Notably, none of the students exhibited excellent hand hygiene compliance. After intervention, significant improvement was observed. The number of students with very poor compliance decreased to 9 (24.32%), and those with poor compliance dropped to 8 (21.62%). Meanwhile, moderate compliance increased to 14 students (37.84%), and 6 students (16.22%) achieved excellent compliance. There was a significant mean difference t-value of 8.606 ( $p \leq 0.001$ ). This indicates that aversive stimuli has effectively enhanced hand hygiene compliance.

**Conclusion:** Participants developed stronger internal motivations to wash their hands, as mental pairing of poor compliance with unpleasant experience reduced the occurrence of undesired behavior. Ultimately, this approach offers a promising, durable approach for improving hygiene behaviors in healthcare settings.

**Keyword:** Aversive, stimuli, hand hygiene, nursing

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## Introduction

### Background of the Study

Hand hygiene plays a key role in breaking the chain of infection thereby reduces the incidence of cross-infection and healthcare-associated infections (HAIs). It is the cost-effective approach to prevent transmission of microbes. Its importance surged during the COVID-19 crisis, reinforcing its role in pandemic response. Healthcare-associated infections (HAIs) are a major global health challenge worldwide.<sup>[1]</sup> Studies consistently show that improving compliance with hand hygiene significantly reduces HAIs.

The World Health Organization (WHO) emphasizes that improving hand hygiene can significantly reduce the spread of pathogens and save lives, yet behavioral adherence remains a persistent challenge. According to WHO, Available evidence shows that compliance with hand hygiene recommendations during health care delivery remains sub optimal around the world, with an average of 59.6% compliance levels in intensive care units up to 2018, and extreme differences between high income and low-income countries (64.5% vs 9.1%). According to NCBI, out of every 100 patients in acute-care hospitals, seven patients in high-income countries (HICs) and 15 patients in low- and middle-income countries (LMICs) will acquire at least one health care-associated infection during their hospital stay. Hand hygiene improvement programs can prevent up to 50% avoidable infections acquired during health care delivery according to WHO.<sup>[2]</sup>

In 2009 the World Health Organization (WHO) published guidelines for implementing and evaluating hand hygiene programmes in healthcare settings.<sup>[3]</sup> The guidelines incorporate 'My Five Moments for Hand Hygiene', which sets out a framework for understanding, training, monitoring and reporting hand hygiene compliance.<sup>[4]</sup>

Hand hygiene is essential for reducing the spread of infections in healthcare settings, food-related

industries, and everyday life. However, studies repeatedly reveal that people often do not follow proper handwashing guidelines as consistently as needed. For instance, covert observations in Taiwan across teaching hospitals identified only a 32 % compliance rate among healthcare workers.<sup>[5]</sup> Similarly, in a Saudi Arabian tertiary hospital, covert observation revealed compliance at 44.9 %, compared to 87 % observed overtly, highlighting the large discrepancy caused by the Hawthorne effect.<sup>[6]</sup>

Behavioral strategies are being explored to improve compliance with health-promoting actions, such as hand hygiene. Aversive stimuli are unpleasant experiences or cues that individuals naturally try to avoid.<sup>[7]</sup> In behavioral psychology, these stimuli are often used to shape behavior through methods like negative reinforcement or punishment. When applied correctly, they can be effective tools in promoting desirable behaviors, particularly in areas like personal hygiene.

Introduction of mild aversive stimuli such as unpleasant odors, sticky sensations, or even images that shows the risk of unwashed hands can be strong reminders. These stimuli trigger discomfort that encourage individuals to wash their hands to avoid the unpleasant feelings. For example, pictures that display bacteria on hands or the serious health risks of poor hand hygiene can influence behavior by creating a desire to avoid those outcomes. For instance, study by Porzig-Drummond et al. (2009), showed that exposure of participants with disgusting videos (e.g., someone sneezing with residual snot) can effectively increase the initiation of hand washing. They subsequently placed disgust/education-based posters in two bathrooms and educational posters in two other bathrooms, inspiring participants to wash their hands, and found that the disgust-based intervention was significantly better at promoting hand hygiene.<sup>[8]</sup>

Using such stimuli in healthcare setup or even in daily routines can help to build healthy habits like regular handwashing. However, it is important to apply these methods carefully to avoid unnecessary

anxiety or harm. When used ethically, aversive stimuli can help improve hygiene overtime by building strong habits driven by the desire to avoid discomfort.

Unlike traditional methods like lectures or external reminders, this technique works by engaging individuals' internal thought processes, creating stronger and more long-lasting behavior change. By mentally associating unwashed hands with the feelings of disgust or discomfort, this conditioning promotes lasting improvements in compliance.

Improving hand hygiene compliance involves changing human behavior, requiring insights from behavioral and social sciences. Since hand hygiene is influenced by multiple factors, no single theory can fully explain it. Understanding the motivational drivers behind hand hygiene is essential for effective interventions.

### **Need of the Study**

In healthcare setting, poor hand hygiene is a typical occupational concern. Transmission of health care associated infection generally occurs via contaminated hands of health care workers often transmitting virulent and multi drug resistant strains. Though preventable with a simple hand washing, health care workers are reluctant to adopt recommended practices to curb these infections.<sup>[9]</sup>

Despite widespread awareness campaigns and institutional policies emphasizing the importance of hand hygiene, proper hand washing is still often neglected. This gap between knowledge and practice poses a significant threat to public health, especially in areas where the transmission of infectious agents can have serious consequences—such as hospitals, schools, food service areas, and community settings.

Traditional interventions like posters, lectures, and hand hygiene audits have achieved varying levels of success, but often fail to bring about lasting behavioral change. These methods largely focus on external reinforcement and do not adequately

address the internal psychological processes that shape an individual's habits and choice. As a result, once external motivators are removed, individuals frequently fall back to previous poor practices.

There is a need for innovative, psychologically grounded interventions that go beyond surface-level awareness and target the root causes of behavioral non-compliance. Aversive stimuli are a useful but underutilized psychological approach that involve associating unpleasant experiences with undesirable habits- such as neglecting handwashing, to make those behaviors seem harmful or unacceptable. This approach can encourage the development of stronger and more lasting behaviors. Despite this potential, the optimal intensity, type and presentation of stimuli remain unclear. Subtle cues may fail to promote meaningful behavior change in some individuals whereas highly intense stimuli could trigger avoidance, habituation or psychological discomfort, reducing the effectiveness of intervention.<sup>[10]</sup> Understanding how to optimize these stimuli can improve intervention design, promote sustained compliance and ultimately contribute to better outcomes.

Considering the global importance of proper hand hygiene and the growing need for more effective behavior change strategies, studying the application and efficacy of aversive stimuli in this context is both timely and necessary.

The topic of this study is focused on improving the hand hygiene compliance among nursing students during clinical posting. The topic chosen for the study would be a useful step towards ensuring proper hand hygiene compliance at workplace in order to reduce the cross infection, Hospital Acquired Infection (HAI) and infection to self. This study aims to assess the effectiveness of aversive stimuli on hand hygiene compliance during clinical posting among nursing students. By evaluating this psychological intervention, the study seeks to contribute to the body of knowledge on behavioral interventions for infection prevention and promote more effective strategies for public health promotion.

## Methodology

### Study Approach and Design

A problem-solving approach and pre-experimental one group pre-test post-test design was adopted in the study. The study was conducted from May – June 2024.

### Samples and Sampling Techniques

The study samples were nursing students enrolled in General Nursing and Midwifery 1<sup>st</sup> year of Holy Family College of Nursing, New Delhi. 37 Nursing students were selected by using convenience sampling technique.

### Data Collection Tools

Modified hand hygiene observation checklist by WHO<sup>[11]</sup>

This tool was used to assess the hand hygiene compliance. This 5-item scale consists of 5 moments of hand hygiene. Each item was scored based on the number of actions performed for each opportunity for hand hygiene.

### Data Collection Process

The study employed a covert observation method to minimize bias. Pre-intervention data collection was done during the clinical posting hours of nursing students assigned to various wards, from 14 May

2024 to 17 May 2024. Following this, students were exposed to aversive stimuli- specifically unpleasant and disgusting images, videos and narratives depicting the consequences of poor hand hygiene. This behavioral intervention was administered from 20 May 2024 to 25 May 2024. Finally, post-intervention observations were conducted from 10 June 2024 to 13 June 2024.

### Data Analysis

SPSS-20 software was used to analyze the quantitative data. Scores of hand hygiene compliance assessed by observational checklist described by frequency and percentage table. Comparison of pre-test and post-test score determined by paired sample t-test.

### Results

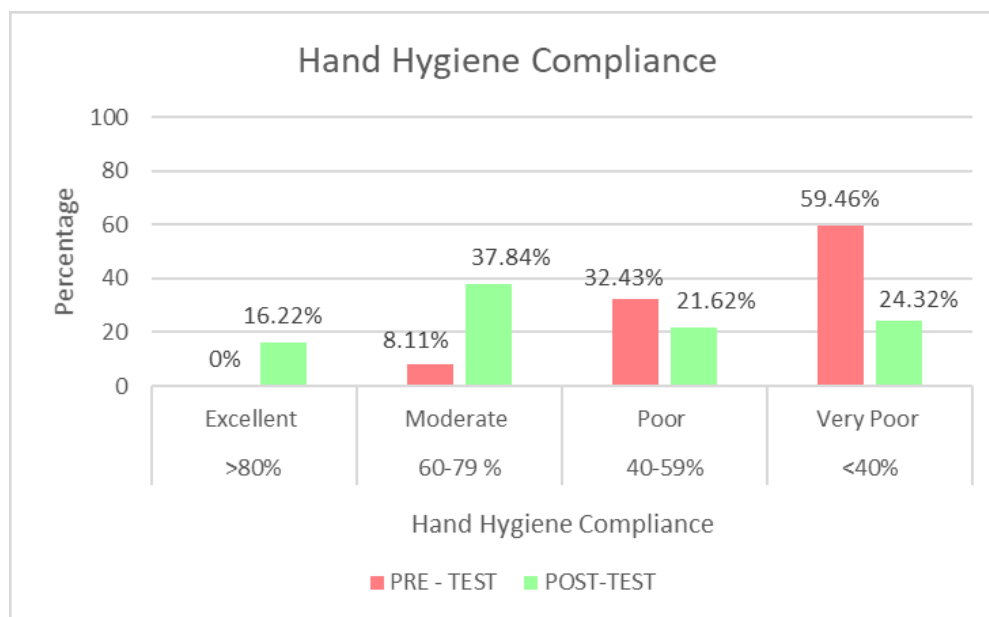
**Section 1:** Findings related to hand hygiene compliance among nursing students.

The data presented in table 1 and figure 1 shows the hand hygiene compliance among nursing students before and after the implementation of aversive stimuli. Prior to the intervention, out of 37 nursing students, the majority 22 students (59.46%) demonstrated very poor compliance, followed by 12 students (32.43%) with poor compliance, and 3 students (8.11%) with moderate compliance. Notably, none of the students exhibited excellent hand hygiene compliance.

**Table 1. Frequency and percentage distribution showing the hand hygiene compliance rate before and after administration of aversive stimuli.**

N=37

COMPLIANCE RATE	INTERPRETATION	PRE - TEST		POST-TEST	
		Frequency	Percentage	Frequency	Percentage
>80%	Excellent Compliance	0	0	6	16.22
60-70 %	Moderate Compliance	3	8.11	14	37.84
40-59%	Poor Compliance	12	32.43	8	21.62
<40%	Very Poor Compliance	22	59.46	9	24.32



**Figure 1:** Bar diagram represents the percentage distribution of hand hygiene compliance among nursing students before and after administration of aversive stimuli.

Following the intervention, a noticeable improvement was observed: 9 students (24.32%) still had very poor compliance, 8 (21.62%) had poor compliance, while the majority 14 students (37.84%) achieved moderate compliance. Additionally, 6 students (16.22%) reached excellent hand hygiene compliance.

**Section 2:** Findings related to the effectiveness of aversive stimuli on hand hygiene compliance among nursing students.

The data presented in Table 2 shows the pre-test mean score is 35.49, standard deviation is 14.19,

post-test mean score is 57.72, standard deviation is 16.9 and the mean difference is 22.23. This shows that there exists a statistical significant difference between mean pre-test and post-test scores of hand hygiene compliance among nursing students.

The computed *t*-value 8.606 was higher than the table value 2.021 for *df* (36) at 0.05 level of significance. Hence null hypothesis is rejected and research hypothesis is accepted. This indicates that the aversive stimuli were effective in improving the hand hygiene compliance among nursing students.

**Table 2.** Mean, mean difference, standard deviation and 't' value of pre and post-test of hand hygiene compliance among nursing students.

N=37

Test	Mean	Standard deviation	Mean difference	t value	df	Table value	p value
Pre-test	35.49	14.19	22.23	8.606**	36	2.021	0.001
Post-test	57.72	16.9					

\*\*Significant at 0.001 level

## Discussion

The present study found that before the exposure to aversive stimuli, among 37 participants, the majority – 22 students (59.46%) – demonstrated very poor compliance, followed by 12 students (32.43%) with poor compliance and 3 students (8.11%) showing moderate compliance. Notably, none of the students exhibited excellent hand hygiene compliance. After the intervention, a significant improvement was observed. The number of students with very poor compliance decreased to 9 (24.32%), and those with poor compliance dropped to 8 (21.62%). Meanwhile, moderate compliance increased to 14 students (37.84%), and 6 students (16.22%) achieved excellent compliance. There was a significant mean difference  $t$ -value of 8.606 ( $p \leq 0.001$ ). This indicates that aversive stimuli have significantly improved the hand hygiene compliance. The findings were in keeping with findings from study conducted by Pellegrino R, Crandall PG & Seo HS (2016), which shows that visual cues, typical of hand washing campaigns, were less effective at increasing hand hygiene compliance than disgust-induced sensory cues. Both visual and auditory cues significantly improved hand washing initiation ( $p < 0.05$ ). However, the olfactory disgust cues produced the strongest effect, showing a significant higher probability of hand washing than all other conditions ( $p < 0.001$ ) and was also more effective than visual and auditory cues ( $p < 0.01$ ).<sup>[12]</sup>

These findings highlights that emotional triggers, especially disgust, can effectively influence hygiene behavior. Disgust is a natural feeling that protect humans from dirty and unhealthy things. By inducing disgust through unpleasant odors or visuals, the body naturally reacts with avoidance or cleansing behavior, such as washing hands. Aversive stimuli, when applied through cognitive-behavioral techniques, can be used to create negative associations with undesirable behaviors such as poor hand hygiene. This method works by encouraging individuals to mentally link poor hand hygiene with unpleasant consequences, such as illness or contamination. These internal rehearsals can strengthen emotional responses like disgust or fear, thereby reducing poor compliance of hand hygiene.

Mental imagery of unpleasant things acts like an internal “stop sign”, strengthening memory cues that highlight the importance of hand hygiene, even in busy or distracting environments. When combined with external reminders (like unpleasant smells or visual), it provides a complete approach to improve hand hygiene practices. By targeting motivation on both internal and external levels, this approach can help create more effective, lasting, and adaptable hygiene interventions.

Such stimuli that induce disgust can play a significant role in shaping behavior by utilizing natural emotional and cognitive responses. This can be applied not only to reinforce hygiene practices but also to support broader behavior modification, habit formation and adherence to therapeutic routines. For behavior modification, aversive stimuli can be used to ingrain desirable behavior by reinforcing actions that allow individuals to avoid unpleasant stimulus.<sup>[13]</sup> By targeting the emotional and sensory pathways that naturally guide human behavior, these interventions provide a practical, low-cost approach to promote desirable habit that helps to improve compliance with health promoting behaviors and potentially support patients with impaired judgement or low insight in clinical settings. The study findings support the careful application of structured behavioral intervention to achieve desired behavior.

## Conclusion

The conclusion drawn from the study is, there is a significant mean difference between mean pre-test and post-test scores of hand hygiene compliance among nursing students which indicates aversive stimuli is effective in improving hand hygiene compliance among nursing students.

## Limitations

The findings of this study are valuable as they contribute to the existing body of knowledge by providing evidence on the effectiveness of behavioral intervention to improve hand hygiene compliance. However, the results should be interpreted with caution due to certain limitations.

Covert observation method is used in this study, which may raise concerns regarding observers bias and the potential for misinterpretation of behaviors. Additionally, the study was conducted in a single setup and relatively small sample size, which limits the generalizability of the findings. In addition, Future research should involve multiple setups with a larger sample size to obtain more comprehensive and generalizable results.

### Implications

- Researchers can investigate the long-term effects of aversive stimuli on hand hygiene compliance, specifically whether the behavior change is sustained after the removal of the stimuli.
- More studies can be conducted by comparing the effectiveness of aversive methods with positive reinforcement strategies, such as the use of rewards, in promoting hand hygiene adherence.
- Further research can be conducted to evaluate the effectiveness of aversive stimuli in addressing various issues that require behavioral change.

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**Conflict of Interest:** None

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