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Construct validity—Current issues and recommendations for future hand hygiene research

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Health care–associated infection is a leading cause of morbidity and mortality. Hand hygiene is widely regarded as an effective prevention strategy. Often, hand hygiene research is designed and conducted by health care practitioners who may lack formal training in research methods, particularly in the area of social science. In a research context, a construct is a concept that can be measured or observed in some way. A construct can be directly or indirectly measured. For example, height can be directly measured by centimeters, whereas depression can be indirectly measured by a scale of 20 items. Every construct needs to be operationalized by measure(s) to make it a variable. Hence, construct validity refers to the degree of fit between the construct of interest and its operational measure. However, issues with construct validity often weaken the translation from construct to measure(s). This article will (1) describe the common threats to construct validity pertaining to hand hygiene research, (2) identify practical limitations in current research design, and (3) provide recommendations to improve construct validity in future hand hygiene research. By understanding how construct validity may affect hand hygiene research design, there is great potential to improve the validity of future hand hygiene research findings.

BACKGROUND

There is a continued interest in examining hand hygiene (HH) as a strategy to prevent health care–associated infection. However, there is a lack of high-quality HH research.[1] Often, HH research is designed and conducted by health care practitioners who may lack formal training in research methods, particularly in the area of social science research.

Construct validity refers to the degree to which a test measures what it claims to be measuring.[2] In research, a construct relates to a trait (eg, hand hygiene compliance [HHC]) that is being evaluated, and it needs to be operationalized by measure(s) into a variable. A construct can be measured directly or indirectly. For example, height can be directly measured by centimeters, whereas satisfaction can be indirectly measured by a 10-item scale. However, poor construct validity often weakens the translation from a construct to measure(s) and makes the research vulnerable to inaccurate or weak measurements.[3]

In this article, the following aspects of construct validity will be discussed: (1) Hawthorne effect, (2) self-reporting, (3) experimenter effect, (4) evaluation apprehension, (5) hypothesis guessing, (6) timing, (7) restricted range, and (8) mono-operation bias. By understanding how construct validity may affect HH research design, there is great potential to improve the validity of future HH research findings. Table 1 provides a list of threats to construct validity for various measures of HH.

Hawthorne effect (observer effect)

Hawthorne effect refers to people's tendency to alter their behavior when they are aware of an observer's presence.[4] Given the tendency to identify information that conforms to the hypothesis, Hawthorne effect can lead to the experimenter interpreting results inaccurately. Hawthorne effect is a major threat to construct validity and therefore is usually controlled with double-blind experimental designs.[44]

Randomized covert observations should be used.[5,8] Different medical students or volunteers can be covert observers to provide more observation opportunities, reducing Hawthorne effect, while maintaining patients' privacy.[8,10] Observers should observe health care workers' (HCWs') HH during their usual care activity. Observers (especially student volunteers) need to understand the logic of care and typical workflow and should receive training in this area

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Table 1
Threats to construct validity for various measures of HH: Practical limitations, examples, and recommendations

Practical limitations	Examples from relevant studies	Recommendations
1. Hawthorne effects (direct observation)		
Observer and selection bias—difficult for observers to be blinded to the hypothesis.[4]	300% increase in HHC when HH is measured using direct observation compared with electronic monitoring.[4]	Before any formal HH observation training, provide training (particularly for student volunteers) to educate observers on the logic of care and typical workflow.[5] Include pilot observation phase in research design to train, validate, and standardize observation techniques among observers.[5,6] Validate observations at the beginning and at regular intervals to ensure accuracy.[7] Be mindful not always to observe HCWs with extreme HH behavior.[5] Only observer HCW's HH during usual care activity.[5]
Infection control staff are usually well-recognized among HCWs—difficult to conduct covert observations.[8]	Lower HHC during covert observations where audits were not announced in advance.[9]	Recruit medical students or volunteers to conduct random covert observations.[8,10] Randomly select HCWs to observe HH.[5]
2. Self-report (self-report)		
Experimenter expectancy—volunteers of self-reports may be inclined to report higher levels of HH.[11]	Systematic overestimation of self-reported HH[12,13] may be because of unrealistic expectations of HHC[14] and the tendency to provide higher ratings of socially desirable behavior such as HHC.[15]	Avoid self-report as the sole or major measure of HH.[16] Ask questions in self-reports that can subsequently be compared with data from direct observation.[17] Surveys should be administered by a researcher who is not acquainted with the respondent.[17]
Selection bias—difficult to select HCWs randomly to participate in self-report of HH.[18]		Random selection of HCWs to participate in self-report is recommended.[18]
Various research designs used to examine self-reports of HH in different health care settings and demographics—difficult to compare results directly.[16]		Appropriate when trying to understand HCW's opinions (instead of using self-report to measure HH).[19] Use anonymous survey instruments.
3. Experimenter effect (direct observation)		
Lack of labor force, confidential observation process and reporting—often conducted by infection control staff. Difficult to randomize schedules and staff involved in direct observations.[20]	HCWs alerted to sanitize their hands whenever they recognized an infection control staff standing by the hallways.[21] HCWs recognized certain characteristics of the experimenter after some time.[23]	Use data-driven approaches (eg, simulations for different observer movement schedules) to generate randomized schedules, personnel, and locations for HH audits.[22] Do not perform covert observations in conjunction with promotional HHI.[24] Randomly select HCWs to observe HH.[5] Be mindful not to always observe HCWs with extreme HH behavior.[5] Observers should be required to observe a minimum number of HH opportunities across different types of HCWs.[25]
4. Evaluator apprehension (electronic monitoring)		
If it not yet possible to have electronic monitoring systems that are entirely hidden.	HCWs may observe HHC because they are apprehensive or concerned about being evaluated by electronic monitoring systems.[26,27]	Consider if it is ideal to provide relevant information on e-monitoring to HCWs and visitors.[28] Avoid disrupting workflow and operations.[29] Have a transparent decision process to allow staff to raise any concerns and get their buy-in.[30]
4. Evaluator apprehension (focus groups)		
Staff of different seniority are often represented from various departments.[31]	Because of social pressure, HCWs may only express opinions that are perceived to be normal or socially desirable.[32]	Questions should suggest that any response is normal (eg, some people said one answer, some said another answer). Use multiple experimenters so that no one is perceived as an evaluator.[33]
4. Evaluator apprehension (self-report)		
Researchers need to collect HHC data from different groups of HCWs.	Identifiers (eg, names, job roles) may cause respondents to feel apprehensive about providing their true opinions.[34]	Perform statistical control for the influence of a socially desirable response style.[17] Pipeline procedure: make respondents believe that the interviewers will learn their true HHC regardless of self-reports because an additional measure will be applied.[35] Questions should suggest that any response is normal (eg, some people said one answer, some said another answer). Use multiple experimenters so that no one is perceived as an evaluator.[33]
5. Hypothesis guessing (direct observation)		
Using initial direct observations to measure baseline HHC, researchers may not want HCWs to know that HH research is in progress.[21] For practical limitations associated with direct observations, see Experimenter effect.	Hypothesis guessing may affect baseline HHC and lead to inaccurate assessment of the actual effects of an HHI on HHC.[21]	Ask subjects for their views of the hypothesis after the study.[2] Do not confirm or alert subjects to the true hypothesis. Only use a small random sample for this inquiry to avoid alerting other subjects.
HCW does not notice HHI (eg, visual cues) after some time.	Although hypothesis guessing may initially increase HHC, sustainability of HHC is difficult when the novelty or awareness of a new HHI is no longer salient.[36]	If necessary, provide subjects with an alternative hypothesis that is not the true hypothesis. Indicate this step explicitly when seeking ethics approval.

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