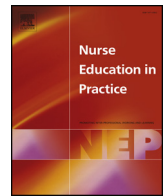




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Original research

## Development and psychometric pilot-testing of a questionnaire for the evaluation of satisfaction with continuing education in infection control nurses

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## ABSTRACT

Satisfaction with continuing education can be defined as positive attitudes towards educational programs, which has potential to strengthen learning outcomes. A multi-dimensional construct may enhance continuing education program evaluation processes. The objective is to describe the development and psychometric testing of the 'affective - behavioral - cognitive - satisfaction questionnaire' (ABC-SAT) for assessing participants' satisfaction with a continuing education program for nurses in infection control. The multi-staged development of a satisfaction questionnaire comprised of three subscales. The pilot tool was administered to a nationwide sample of 126 infection control nurses to assess satisfaction after participating in a continuing education program. Satisfaction scores were calculated and psychometric testing was performed to determine reliability, using Cronbach's alpha, face validity, objectivity, and economy. A principle component analysis using varimax rotation and Kaiser normalization was performed. The analysis led to a three-factor solution of the questionnaire with 11 items, explaining 61.4% of the variance. Internal consistency of three scales using Cronbach's alpha was 0.83, 0.60, and 0.66, respectively. Selectivity coefficients varied between 0.39 and 0.70. Participants needed approximately three minutes to complete the questionnaire. Initial findings refer to a satisfying scale structure and internal consistency of the 3-dimensional ABC-SAT questionnaire. Further research is required to confirm the questionnaires' psychometric properties.

### 1. Background

According to the World Health Organization (2011), approximately 1.7 million patients are affected by nosocomial infections in the United States every year (WHO, 2011). Nosocomial infections caused approximately 99,000 deaths, and 6.5 Billion US dollar extra costs (WHO, 2011). In the European Union, approximately 4.1 million patients are affected by nosocomial infections every year, leading to approximately 37,000 deaths annually (WHO, 2011). Recently, the European Center for Disease Prevention and Control estimated the occurrence of more than 2.6 Million new cases of nosocomial infection in the European Union every year (Allegranzi et al., 2017). Nosocomial infections cause 16 million more days in hospitals, leading to 7 Billion Euro extra costs a year in the Europe Union (WHO, 2011). In Germany, national statistics state that 400,000–600,000 patients suffer from nosocomial infections every year, whereby 10,000–15,000 infections are lethal (Gastmeier

and Geffers, 2008 cited after Häfner et al., 2015). Based on 20–30% avoidability rates, approximately 4500 patients die because of avoidable infections (Gastmeier and Geffers, 2008 cited after Häfner et al., 2015). More recent data estimate that 6000–15,000 patients die because of nosocomial infections in Germany every year (Gastmeier et al., 2016). Considering these facts, continuing education and training among healthcare professionals may hold potential to improve healthcare-related outcomes (Moreira et al., 2015; Ward, 2011). Moreover, Aiken and associates (2014) demonstrate that in-hospital patient mortality can be reduced significantly by the direct care of healthcare professionals holding higher educational degrees. In addition, work processes and tasks are constantly changing and becoming more dynamic and complex (Booth et al., 2016; Kastner, 2009). In order to meet these demands, healthcare professionals, specifically infection control nurses, are often expected to assume new responsibilities and deliver new care strategies for which their previous training has left them

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unprepared (KRINKO, 2009 (German Commission for Hospital Hygiene and Infectious Diseases Prevention)).

Infection control nurses are essential to fulfill the demand of infection prevention, and ultimately to reduce hospital acquired infections (Venberghe et al., 2002). Worldwide, the major roles of infection control nurses include infection prevention, management of outbreaks, and surveillance (Loveday et al., 2003; Quattrin et al., 2004; Kim and Choi, 2014; Zitella et al., 2006). In Germany, a new legislative guideline was initiated (KRINKO, 2009) requiring infection control nurses to train infection control link nurses. Infection control link nurses are nurses with an advanced training in infection prevention and control. They are supposed to be on every ward in every hospital nationwide (KRINKO, 2009; Peter et al., 2014). Overcoming the challenge of this new responsibility can be addressed by taking advantage of continuing education and training possibilities (Müller and Seidl, 2000; Holloway et al., 2018). Therefore, a four day modular curriculum addressing the KRINKO, 2009 guidelines has been developed, implemented, and evaluated (Peter et al., 2014, 2015; Krueger et al., 2017).

As a result, infection control nurses were educated in hygiene-related aspects, along with communication skills, dynamics of group processes, and peer-teaching skills (Krueger et al., 2017).

Evaluation of continuing education and training courses supports a successful implementation and utilization of psychometrically tested questionnaires to portray and quantify the success of education and training courses (Moosbrugger and Schweizer, 2002; Øvretveit, 2002). Kirkpatrick and Kirkpatrick (2006) defined satisfaction as the first of four consecutive stages of evaluation of continuing education being: 'reaction', 'learning', 'behavior', and 'results'. Within this framework (Kirkpatrick and Kirkpatrick, 2006), stage one 'reaction' to the continuing education and training courses can also be seen as a synonym for satisfaction (Kirkpatrick and Kirkpatrick, 2006). Satisfaction as part of a learning context can be recognized as an important construct for a successful transfer of skills, knowledge, and competencies (Diener et al., 1999; Eysenck and Keane, 2010; Rolls, 2014; Squire and Zola-Morgan, 1991; Ulfing, 2008; Wolfe, 2006; Kirkpatrick and Kirkpatrick, 2006; Fishbein and Ajzen, 1975; Gerrig and Zimbardo, 2008).

Satisfaction with education and training courses holds potential to strengthen learning outcomes (Kirkpatrick and Kirkpatrick, 2006; Nocera et al., 2016). Kirkpatrick and Kirkpatrick (2006) argue that the evaluation of happiness with so called 'happiness sheets' might be sufficient. In the context of continuing education and training courses the satisfaction construct can be displayed by an individual's attitude towards an object (Westermann et al., 1996; Heise et al., 1999 cited in Damrath, 2006; Czepiel and Rosenberg, 1977 cited in Stock, 2003). Attitude, being a general evaluation towards an object in question, consists of three components (affect, behavior, cognition) (Fishbein and Ajzen, 1975; Ajzen, 2001; Gerrig and Zimbardo, 2008). Apart from the affective and cognitive components, Gerrig and Zimbardo (2008) described 'behavior' as third dimension regarding attitude, which is the foundation of human behavior (Kruglanski et al., 2015). All three dimensions should be considered in the evaluation of satisfaction with continuing education and training courses.

To date, satisfaction with education and training courses has often been measured as an undifferentiated construct based on so-called 'happiness sheets', describing satisfaction as one-dimensional in the sense of 'happiness' with the continuing education and training program (Yom, 2004; Smits et al., 2003; Kirkpatrick and Kirkpatrick, 2006). In contrast to the measurement of satisfaction with education and training courses, existing questionnaires in the healthcare sector for a more differentiated measurement of satisfaction, focus mainly on the job satisfaction construct (Taheri et al., 2015; Faye et al., 2013; Romig et al., 2011; Björk et al., 2007; Arnetz and Hasson, 2007; Schiestel, 2007; Rambur et al., 2005; Matsumoto et al., 2004).

Considering the importance of continuing education for infection control nurses and the importance of satisfaction with continuing education courses outcomes, the aim of the study was to develop and

pilot-test a questionnaire to measure the three dimensions of satisfaction (affect, behavior, cognition).

## 2. Methods

### 2.1. Design

A multi-staged study design was used to develop and pilot-test a questionnaire for measuring the satisfaction of infection control nurses with continuing education and training programs. The assessment was a component of evaluating a new curricular structure for education and training of infection control nurses in the acute care setting. The continuing education and training program was designed to educate infection control nurses to provide didactic skills and psychological knowledge with respect to infection control. To enhance didactic skills, appropriate teaching methods and communication were educated. Therefore, the infection control nurses were educated in specific fields of psychology, including general, cognitive, and social psychology. This study has a positive ethics recommendation for implementation. The study was approved by the institutional review board of the investigators institution.

All participants gave written informed consent for the study. Content of the curriculum was delivered within four modules. Questionnaires were provided for the evaluation of satisfaction with the continuing education and training after each consecutive module. Module three was used to perform the factor analysis because of its greatest timeliness and it was the last content-related module. Module one to three can be seen as the core curriculum. Module four was constructed as a refresher module. Four-week cool-down periods were provided between modules one, two and three, while a 3–4 months' cool-down period was given between modules three and four. The paper-pencil questionnaire was filled out and returned anonymously after the course. The participants completed the questionnaires unstructured, put them unsorted into an envelope, which was sealed and handed to the lecturer. This procedure is practical and can contribute to a satisfactory response rate (Nulty, 2008).

### 2.2. Initial development of the questionnaire

A multi-stage procedure, following the Food and Drug Administrations (FDA) Guidelines 2009 for developing a Patient Reported Outcomes (PRO) instrument (FDA, 2009), was used to develop the questionnaire. Accordingly, a thorough literature review was conducted and expert panel interviews were performed in order to identify the clinical and scientific content of the initial instrument.

In the first stage, items of the questionnaire were developed based on findings from the literature and an expert panel review (Krueger et al., 2017). The initial instrument was designed respecting the multi-dimensional structure of satisfaction including affective – behavioral – cognitive elements and was based on the definition of satisfaction as an 'attitude' (Westermann et al., 1996; Heise et al., 1999 cited in Damrath, 2006; Czepiel and Rosenberg, 1977 cited in Stock, 2003). This approach was used to encompass all relevant dimensions of satisfaction (Fishbein and Ajzen, 1975; Ajzen, 2001; Gerrig and Zimbardo, 2008).

In the second stage, the questionnaire items were tested for face validity by a panel of independent experts of infection control nurses not involved in this project. Based on this feedback, thorough modifications were inserted. A compilation followed, in which the items were combined to form the pilot questionnaire. In the last stage, a pre-test was performed to assess the practicability, readability, feasibility, and economy of the questionnaire. Lastly the questionnaire was reviewed by the expert group for its usability. The development stages culminated in a questionnaire comprised of three subscales to reflect the affective - behavioral - cognitive dimensions of satisfaction (ABC-SAT questionnaire).

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