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Nursing students' perceptions of a video-based serious game's educational value: A pilot study

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ABSTRACT

Background: Despite an increasing number of serious games (SGs) in nursing education, few evaluation studies specifically address their educational value in terms of face, content, and construct validity.
Objectives: To assess nursing students' perceptions of a video-based SG in terms of face, content, and construct validity. In addition, the study assessed perceptions of usability, individual factors, and preferences regarding future use.
Design: A pilot study was conducted.
Setting and Participants: An SG prototype was implemented as part of two simulation courses in nursing education: one for home health care and one for hospital medical-surgical wards. The SG aimed to teach clinical reasoning and decision-making skills to nursing students caring for patients with chronic obstructive pulmonary disease. A total of 249 second-year nursing students participated in pilot testing of the SG.
Method: A paper-based survey was used to assess students' perceptions of the SG's educational value.
Results: Overall, students from both simulation courses perceived the SG as educationally valuable and easy to use. No significant differences were found in perceptions of educational value between nursing students with previous healthcare experience versus those with none. However, significantly more students in the home healthcare simulation course indicated that the SG tested their clinical reasoning and decision-making skills. Students from both the medical-surgical and home healthcare simulation courses suggested that more video-based SGs should be developed and used in nursing education.
Conclusions: Overall, the survey results indicate that the participants perceived the SG as educationally valuable, and that the SG has potential as an educational tool in nursing education, especially in caring for patients with chronic diseases and in home healthcare simulation. Showing a SG's educational value and user acceptance among nursing students may justify the development and application of more SGs in nursing education.

1. Introduction

Serious games (SGs) represent an emerging teaching and learning strategy in health education and in other fields (Cant and Cooper, 2014; Wattanasoontorn et al., 2013). SGs are computer-based simulations that incorporate principles from multimedia and gameplay for the purpose of improving health professionals' knowledge, skills, and confidence (Cant and Cooper, 2014). They thus constitute an e-learning resource that can provide nursing students with an opportunity to practice their clinical reasoning and decision-making skills in a realistic environment where there is no risk of harm to patients (Cant and Cooper, 2014; Ribaupierre et al., 2014).

A systematic literature review on the effectiveness of computer games and SGs shows positive outcomes like knowledge and skill acquisition, and behavioural changes (Boyle et al., 2016). However, there is no clear consensus on the utility of serious games in health education (Boyle et al., 2016; Graafland et al., 2014). Studies on the effectiveness of SGs have had a range of aims, and have obtained various kinds of data (All et al., 2016; Boyle et al., 2016), making comparison difficult. In addition, insufficient understanding of best practices in SG design may hamper the effectiveness of the product in some cases (Graafland et al., 2014). Moreover, there has been limited focus on issues of design validity (Graafland et al., 2014; Mohan et al., 2014). Finally, many SG's have not undergone proper quality assurance, because this is

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considered a long, costly enterprise (Graafland et al., 2014).

Educational value is generally measured in terms of performance outcomes for aspects of knowledge, skills, or attitude (All et al., 2016; Graafland et al., 2014), and less frequently based on aspects such as the SG's degree of realism/authenticity (face validity), alignment of content and tasks with curricula (content validity), and the SG's ability to meet the learning objectives of aiding acquisition of and testing knowledge and skills (construct validity) (Graafland et al., 2014; Nicolaidou et al., 2015). In a literature search, few studies were found (Georg and Zary, 2014) specifically addressing nurses' or nursing students' perception of aspects like face, content, and construct validity in SG evaluation. Most validation studies have instead focused on measuring the improvements in knowledge and clinical competency of SGs (Moattari et al., 2014). To address this gap, the primary aim of the present study was to assess nursing students' perceptions of a video-based serious game in terms of face, content, and construct validity. In addition, the study assessed perceptions of usability, individual factors, and preferences regarding the future use of this kind of e-learning resource in the participants' Bachelor of Nursing programme.

2. Background

2.1. Educational Value of an SG

To develop SGs that facilitate active, experiential, situated, and problem-based learning requires emphasis on aspects including user specifications, pedagogy, audiovisual and haptic representation (fidelity, interactivity, and immersion), and context (Annetta, 2010; Arnab et al., 2015; de Freitas and Liarokapis, 2011). In addition, to ensure SGs' educational value, the games' face, content, and construct validity need to be considered (Graafland et al., 2014). *Face validity* refers to the degree of realism and the resemblance of the SG to an actual clinical practice setting (Graafland et al., 2014; Schijven and Jakimowicz, 2005). *Content validity* refers to the degree of empirical foundation and theoretical basis of the SG (Graafland et al., 2014; Schijven and Jakimowicz, 2005) and in particular the alignment of the SG's content with evidence-based knowledge and curricula in a health education programme. *Construct validity* is considered to be the most important kind of validity, and refers to the SG's ability to meet its purpose (Graafland et al., 2014), in this case facilitating knowledge acquisition and skills development. Since one of the main purposes of SGs is to increase students' confidence and ability to apply acquired knowledge and skills to real-word situations (All et al., 2015), this study considers knowledge and skill *transferability* as a component of construct validity.

For an SG to achieve its intended purpose of supporting learning there needs to be congruity between the SG's content and its elements or components of representation, challenge, and engagement (All et al., 2015; Arnab et al., 2015; Boyle et al., 2016). Consequently, the assessment of SGs' educational value needs to include not only aspects like face, content, and construct validity (Graafland et al., 2014), but also the components that support its educational value and promote user acceptance and intention of future use (Venkatesh et al., 2016).

2.2. The SG Prototype

The SG prototype designed in a preliminary study (Johnsen et al., 2016) comprises four video-based scenarios: two in a home healthcare setting and two in a hospital setting. In all four scenarios, the SG user has to handle situations in which a patient experiences deterioration of his COPD: a noninfectious exacerbation (scenario 1) and an infectious exacerbation (scenario 2). To increase realism (face validity), two registered nurses (RNs) and a person with COPD participated as actors in the scenarios. A screenshot of one of the hospital scenarios in the SG prototype is provided in Fig. 1.

To promote content and construct validity, the SG was designed to reflect the evidence-based knowledge incorporated in the curricula of the site university's Bachelor of Nursing programme, as well as Norwegian national guidelines for the treatment of patients with COPD (Almås et al., 2010; The Norwegian Directorate of Health, 2012). The quiz-based tasks and questions that are presented on the screen during each scenario were designed to ensure that users needed to apply knowledge and to analyse and synthesise information based on cues in the scenarios (Bloom, 1956). In addition to learning and decision-making theory, SG design principles and human–computer interaction theory (Laamarti et al., 2014; Wattanasoontorn et al., 2013) were employed in the development of the SG.

3. Methods

3.1. Design

A pilot study was conducted by implementing the prototype SG within the curriculum of a Bachelor of Nursing programme. A voluntary survey was administered to assess the nursing students' perceptions of the SG's educational value.

3.2. Setting and Sample

The study was conducted at a School of Nursing in southern Norway. All 249 nursing students in the second year of their Bachelor of Nursing programme, across two campuses, were provided with access to the SG, and all took part in the study.

3.3. Survey Design

The survey instrument was developed specifically for this study, but the questions were largely informed by previous research on the evaluation of serious and virtual games and other simulations. The survey consisted of open and closed-ended questions. This included statements addressing the SG's degree of realism/authenticity (face validity), the alignment of content and tasks with curricula (content validity), the SG's ability to meet the learning objectives (construct validity), as well as usability and background characteristics, and preferences regarding the future use of this kind of e-learning resource. Both positively and negatively worded statements were included to reduce response set bias, such as the tendency to consistently express extreme attitudes (i.e., strongly agree or strongly disagree) or to agree or disagree with statements regardless of their content (Polit and Beck, 2010). A five-point Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree) was used. In addition, the opportunity to answer “I don't know” was provided. In the last section of the survey, the participants were asked if they thought this kind of e-learning resource should be further developed in nursing education involving other types of patients, and were asked to propose other patient groups for whom it would be useful to develop such functionality. The participants could also write general comments in text boxes. The survey was reviewed by all authors and was pre-tested (Polit and Beck, 2010) by four colleagues from different disciplines within the health or social sciences to ensure its content and construct validity. Some questions were added, rephrased, and removed as a result.

3.4. The Pilot Study

The SG prototype was integrated into the curriculum as part of a two-week simulation course intended to prepare nursing students (n = 249) for clinical placement in home healthcare and in surgical or medical wards in hospitals. The participants were informed that an evaluation study would be conducted of the SG, but that it was voluntary to answer the survey.