

## Impact of simulation training on pre-clinical and clinical practice: the example of Tallinn Health Care College

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**Abstract.** The simulation environment and high-fidelity simulators set new challenges for lecturers. The positive impact of simulation training on the development of students' knowledge and skills has been confirmed, but little research has been conducted on the factors that are key elements to performance. The aim of the study was to assess the impact of simulation training on the acquisition of students' skills and learning outcomes in pre-clinical practice and in a practical working environment. The current study is empirical and descriptive, using qualitative and quantitative methods. The study was carried out in 2017–2021. The sample consisted of second-year students and faculty members with simulation teaching experience. Semi-structured interviews were conducted with 5 university lecturers and 16 students. The Educational Practices Questionnaire (78 students) (National League for Nursing 2005) and the Creighton Competency Evaluation Instrument (83 students) (Creighton University 2014) were used and 138 students' practice documentation was assessed. The interviews and documents were analysed using a qualitative content analysis method and the quantitative data were analysed by the method of descriptive statistics. The overall impact assessment of simulation training was visualized by Kirkpatrick's Four-Level Training Evaluation Model (Kirkpatrick Partners 2017). Simulation training improves the ability to establish links, consolidate knowledge and helps to cope with stressful clinical situations. Negative aspects were video criticism as part of the teaching method, lack of clarity for learning outcomes, limited individual feedback and distortion of reality in the clinical setting. The effectiveness of simulation training is influenced by the teaching staff's competence and the students' prior experience in the clinical setting.

**Keywords:** simulation training, impact, pre-clinical practice, clinical practice.

### 1. INTRODUCTION

Today, teaching is primarily defined as the creation of conditions for learning. We understand learning as an active process of constructing knowledge, which is triggered by the interpretation of experiences in a situation designed by the teacher. In this case, students have the opportunity to learn in a constructivist way, i.e. by actively experiencing, planning, processing information, and making connections. Concepts are formed based on individual experience, meaning that the choice of teaching methods is often crucial for effective teaching and learning (Meakim et al. 2013).

Simulation is an activity that resembles reality and has been used in nursing education in various ways since the 1960s. As science, technology, and education have evolved, simulation has become an innovative teaching and learning strategy (Fisher and King 2013). Simulation is considered the most widely used strategy for teaching nursing skills and is an integral part of nursing education (Rutherford-Hemming et al. 2016; Hussein and Favell 2022; Sterner et al. 2023).

Many of the research findings confirm the positive impact of simulation learning on the formation of students' knowledge, skills, and attitudes, but few studies have been conducted on the influencing factors that are key components in terms of performance (Shin et al. 2015; Hussein and Favell 2022; Alshehri et al. 2023). Evaluation of the

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performance of simulation learning is one of the most problematic topics, yet it is also essential for improving the quality of learning (Powers 2014; Chen et al. 2015; Leighton et al. 2015). Previous authors have observed that in simulation learning, the resources of the learning environment and the concept of teaching are the factors influencing the acquisition of affective, cognitive, and psychomotor skills (Shin et al. 2015; Alshehri et al. 2023; Tamilselvan et al. 2023).

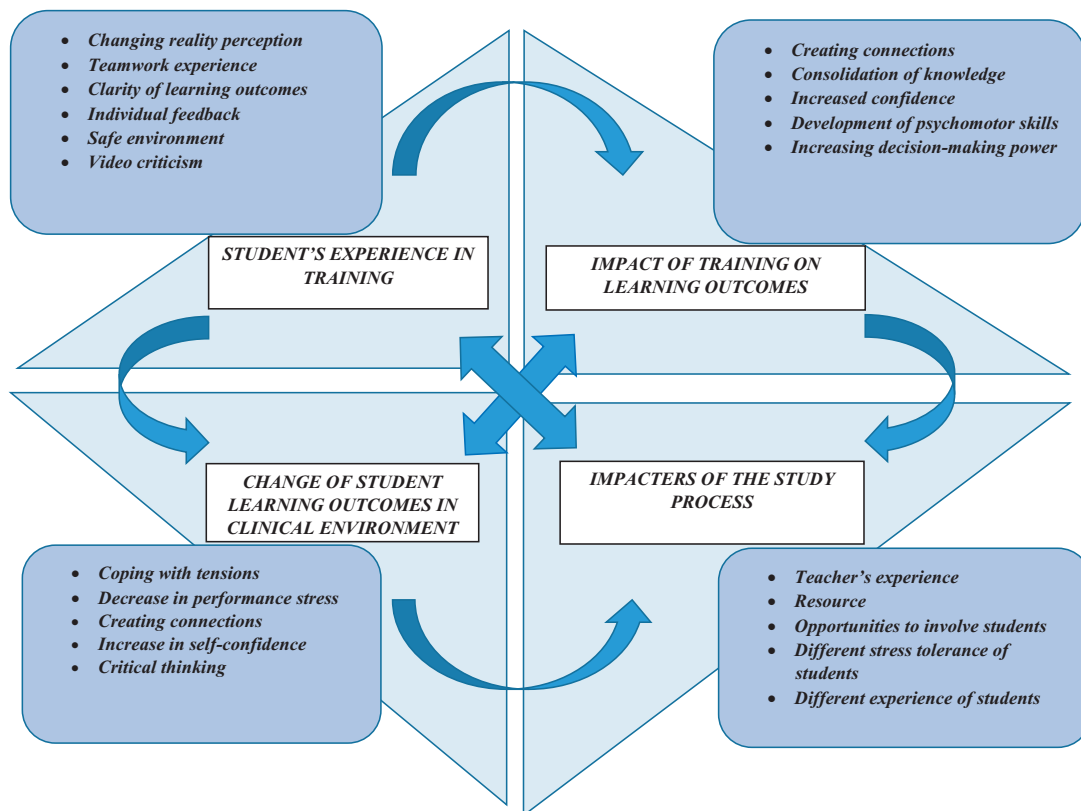
With the modernization of the study infrastructure in 2014, a modern simulation centre was built for Tallinn Health Care College; the simulation environment and high-tech simulators have inevitably created new challenges for the teaching staff, both in terms of planning studies and students' acquisition of skills. The teaching is guided by the standards of good practice in simulation learning established by the International Nursing Association for Clinical Simulation and Learning (INACSL Standards Committee 2016a, 2016b, 2016c), but the impact on the acquisition of knowledge and skills by students was unknown. The objective was to describe the impact of simulation learning on students' acquisition of skills and learning outcomes in pre-clinical and clinical practice. The following tasks were set based on the objective:

- Describe the experiences of teaching staff in relation to students' acquisition of skills and learning outcomes in pre-clinical practice.
- Describe the experiences of students in relation to acquiring skills and learning outcomes in pre-clinical practice.
- Describe the impact of simulation learning on students' acquisition of skills and learning outcomes in clinical practice.

## 2. MATERIALS AND METHODS

### 2.1. Theoretical approach

The conducted research used a combination of both qualitative and quantitative research methods. In choosing the combined research methods, the authors proceeded from previously published similar research papers. The plan was prepared on the basis of the Four-Level Training Evaluation Model developed by Kirkpatrick (2006) in 1996, which states that it is important to assess the impact of learning based on learners' experiences with learning, the impact of learning on learning outcomes, changes in learning activities, and changes in learners' learning outcomes (Fig. 1).



**Fig. 1.** The overall impact assessment of simulation training, visualized by Kirkpatrick's Four-Level Training Evaluation Model (Kirkpatrick Partners 2017).

## 2.2. Sample

At the first stage, the experience of teachers in relation to the application of high-tech simulation in nursing education was studied using the qualitative method. In order to ensure the relevance of the data being studied, a preliminary sample was formed of teachers of Tallinn Health Care College, who had at least one year's experience with simulation learning at the time of the data collection. Five teachers met the above criteria at the start of the data collection, and these five constituted the final sample.

The second stage examined the experiences of students of nursing and midwifery curricula in relation to simulation learning. Students were studied using both qualitative and quantitative research methods. The sample of the qualitative research comprised second-year midwifery and nursing students who had completed simulation practice. A total of nine midwifery students and seven nursing students participated in the study. The sample of the quantitative research was composed of second-year students who had completed pre-clinical practice at the Simulation Center during the autumn and spring semesters of the 2017/2018 and 2018/2019 academic years. A total of 78 Educational Practices Questionnaires (Student Version) and 83 Creighton Competency Evaluation Instruments were used for the analysis.

At the third stage, qualitative data were collected from the shared electronic e-learning environment Moodle of Tallinn Health Care College. The document analysis database consisted of 138 students' practice documents of the 2018/2019 and 2019/2020 academic years in the e-learning environment, which cover the collected information regarding the learning outcomes achieved during practice, the students' self-reflection, and the assessment of the student and the supervisor. The sample was formed of practical training documents that describe the impact of simulation learning on clinical practice.

## 2.3. Data collection

Two qualitative, empirical and descriptive studies were conducted and data were collected using the semi-structured interview method. The qualitative research method is used to describe people's experiences and give them meaning (Burns and Grove 2001; Bradshaw et al. 2017). In order to encourage freer self-expression among the respondents, data were collected using semi-structured interviews, where the researchers used a prepared structure and research tasks based on the objective of the research. Semi-structured interviews, where the researcher has some predefined questions or topics but then probes further when the participant responds, can produce powerful data that provide insights into the participants' ex-

periences, perceptions or opinions (Peters and Halcomb 2015).

Data collection from teachers was carried out between March 2017 and April 2017, from midwifery students in October 2017 and from nursing students in December 2018. The subjects were interviewed in a separate room at a previously agreed time. The purpose of the research and the interviewing process were introduced to the interviewees. The interviews were recorded using a dictaphone with the prior consent of the interviewees and subsequently transcribed with the aim of reflecting as accurately as possible the interviewees' nuances of the spoken language, pauses, unfinished sentences and, if necessary, adding explanatory emotions in parentheses. Additional subjects were not included, as data became saturated and no new ideas were added to the text analysis. Saturation is the building of rich data within the process of inquiry, by attending to scope and replication (Morse 2015).

To collect data from empirical, quantitative and descriptive research, a Likert-type metric – the Educational Practices Questionnaire (Student Version) with a five-point (1–5) scale – was used to measure students' assessment of participation in simulation learning and the achievement of learning outcomes. The Creighton Competency Evaluation Instrument was used to measure the achievement of learning outcomes. Both instruments were translated and adapted, and data were collected during the autumn and spring semesters of the 2018/2019 academic year. The Cronbach's alpha internal consistency coefficient for the whole scale of the Educational Practices Questionnaire was 0.817 and the Creighton Competency Evaluation Instrument was 0.817.

Data from the shared electronic e-learning environment Moodle of Tallinn Health Care College were collected in the academic years 2018/2019 and 2019/2020, shortly after second-year students completed their clinical practice. All student entries reflecting the connections between simulation learning and clinical practice were considered suitable study materials. The entire database (sentences found in the database) was rewritten word for word.

## 2.4. Data analysis

Inductive content analysis was used to analyse the qualitative data from documents and teachers' and students' interviews. Inductive content analysis is recommended if there is not much prior information on the phenomenon being studied (Elo and Kyngäs 2008). For the existing documents and interviews, it was possible to pay attention to rare or unique phenomena in the text. The analysis was mainly text-based, without reducing the richness of the content of the texts. The sentences corresponding to the research questions were simplified, coded, further grouped,

**Table 1.** The process of category formation

Segment of idea in the database	Substantive codes	Subcategories	Categories
<i>‘After all, we get to know each other better through these simulations than just in class.’ (6)</i>	Getting to know each other	Experiences related to cooperation	Experiences related to the professional development of midwives
<i>‘It’s a very good cooperation, in fact, all participants have to work very hard for something good to come out of it.’ (2)</i>	The importance of teamwork		
<i>‘You get to know yourself and you also learn about your mistakes that you may not immediately remember.’ (8)</i>	Getting to know yourself	Experiences related to self-perception	
<i>‘I think the most important thing is that I realized that you shouldn’t overestimate yourself.’ (2)</i>	Self-criticism		

and then subcategories were formed. As a result of abstraction, subcategories with the same content were grouped together, forming higher categories, which in turn were grouped into main categories. An explanation of how the concepts or categories are created should be provided to indicate the trustworthiness of the study (Elo et. al. 2014). An example process of forming the categories is presented in Table 1.

The quantitative results were analysed using the Microsoft Excel 2011 spreadsheet software package and version 22.0 of the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used for data analysis. For continuous data, means of the scales were calculated. Continuous data provide information that can be measured on a scale (Giuliano and Polanowicz 2008).

**2.5. Ethical considerations**

Permission to conduct the applied research was gained from Tallinn Health Care College (No. 1-16/70, issued on 01.03.2017). Creighton University was contacted and permission was sought to use the Creighton Competency Evaluation Instrument.

The subjects completed an informed consent form of the interviewee before the interviews, and these were signed digitally. The interviews were voluntary and anonymous, following the protection and confidentiality of personal data. The names and other personal data of the participants were not used in the study.

Codes known only to the researchers were used in the current research for presenting quotes, to ensure that the participants could not be identified. Transcriptions of the interviews and sound files were preserved in computers

of the researchers, which were protected with passcodes and were available only to the authors of the research. After completing the research paper, all the transcriptions and audio files were deleted. There are appropriate references to other authors’ ideas to avoid plagiarism. To prevent possible errors during data analysis, any possible missteps that might occur during the data insertion process were avoided. After data insertion, the credibility of the data and the coding of the characteristics were checked.

**3. RESULTS**

**3.1. The experiences of teachers in relation to students’ acquisition of skills and learning outcomes in pre-clinical practice**

The main category ‘The experiences of teachers in relation to conducting simulation training’ is formed of substantive codes, which were combined into six subcategories, and the latter to three categories, covering experiences related to the competence of the teacher, the environment in which the studies were conducted, and the learning process (Table 2).

In terms of the **learning process**, all faculty members confirmed the need for high-tech simulation learning in teaching. One of the positive aspects of this method of learning was safety, both from the point of view of the student and the patient.

*‘Patient safety /.../ – what we’re really expecting... /.../ most things can actually be covered: we can monitor communication, let alone safety – that safety is... part of almost every situation.’ (Interview 3); ‘The positive thing*

**Table 2.** The experiences of teachers in relation to conducting simulation training

Subcategories	Categories
Teaching experience	Teacher's competence
Readiness of the teacher	
Technical resources	Learning environment
Teamwork	
Study organization	Learning process
Positive aspects of the learning method	

*about simulation learning is that we can create a situation that's relatively close to real life, where students can then perform the expected tasks in a safe environment, solve situations without actually... actually involving sick people.'* (Interview 4)

Feedback received in re-watching the videos is also seen as an aspect that promotes and supports learning. Another positive aspect that the teachers highlight is the feedback aspect of the teaching method, which has created a prerequisite for smooth restructuring of theoretical studies.

*'It's this video review and everything and that they see what they're doing, how they're watching themselves from another perspective. /.../ they're already thinking a lot more – they can analyse and see different problems'* (Interview 1); *'/.../ we have the possibility of video review. It's a pretty good learning method. /.../ And actually then they see themselves...'* (Interview 4)

Regarding the **teacher's competence**, there was uncertainty in relation to the implementation of the teaching method, which manifested itself in questioning the sufficiency of current knowledge on the teaching method. In terms of the **learning environment**, the problems of the size of study groups and the lack of support staff in conducting simulation sessions were raised.

*'We actually feel the need for an assistant – a technical assistant, because right now it's a waste of the teacher's time when... when the teacher must be... then... act as technical support, so to speak.'* (Interview 1); *'The technical side is very difficult, and these experiments with small groups showed that a teacher alone can't perform this task because you have to direct the dolls – turn on, switch, and someone is watching the student who is sitting – talking into the microphone, and the third is right in the hall, debriefing. /.../ this is the minimum that we should have.'* (Interview 2)

The main category 'The experiences of teachers in relation to students' acquisition of nursing skills' is formed

of substantive codes, which were combined into six subcategories, and the latter into three categories, covering the spheres of affective, cognitive, and psychomotor skills (Table 3).

In terms of **psychomotor skills**, the teachers highlighted the positive impact of the teaching method and decision-making abilities of the students, as well as the confidence that grows as the studies progress. In terms of the acquisition of nursing skills by students, one of the questions that arises is the suitability of such a teaching method from the point of view of the effectiveness of studies. This is especially true for **affective skills** during the initial stages of the learning process since people's stress tolerance and degree of courage are inevitably different. Regarding **cognitive skills**, the teachers find that simulation helps students to better see the entire picture and adopt decisions based on this by making connections, while integrating aspects of both teamwork and communication.

**Table 3.** The experiences of teachers in relation to students' acquisition of nursing skills

Subcategories	Categories
Motivation	Affective skills
Feelings	
Teamwork	Cognitive skills
Students' (professional) development	
Proficiency	Psychomotor skills
Manual skills	

*‘I can realistically see that simulation helps students to make decisions.’ (Interview 2); ‘... at the second or third task they are already bold, they can even argue and contradict us – and we really like it because there is courage, confidence, and they make decisions and defend their decisions. Because the decision comes from where? Context. And if a student sees the context as such and makes a decision, he or she will defend that decision.’ (Interview 1); ‘What I see is that students develop, make more connections. /.../ The students themselves /.../ point out: ‘Well, now I understand..., right, what that meant, what was said in that department or somewhere in surgery, or maybe in a hospital infection..., right..., that now I understand it in a completely different way /.../ it’s like... really great...’ (Interview 3)*

**3.2. The experiences of students with the acquisition of skills and learning outcomes in pre-clinical practice**

*3.2.1. Qualitative results regarding students’ experiences*

The main category ‘Acquisition of skills and learning outcomes by the students in simulation studies’ is formed of substantive codes, which were combined into ten subcategories, and the latter into three categories, covering the experiences related to professional development, learning environment, and learning process (Table 4).

The students’ experiences were primarily related to the **professional development** in the field, which included

experiences related to cooperation, experiences relevant to themselves, and experiences of coping with stress. The students very much appreciated the possibility of working together with fellow students and the experience of teamwork as a whole.

*‘We actually get to know each other better through these simulations than just in class...’ (Interview 6)*

Lack of previous clinical experience was highlighted as experiences relevant to themselves, which made some participants feel bad and afraid of this method of learning because they feared making mistakes and did not want fellow students to be critical of their actions.

*‘At first it was really scary because everybody was watching and the cameras and... but as time went on, the more you just go there, you don’t think about someone watching you there, that the whole class is watching you...’ (Interview 5)*

However, simulation training was also introduced as an opportunity to test oneself and one’s critical thinking skills.

*‘In this regard, you get to know yourself and you also learn about your mistakes that you may not immediately remember and that you missed...’ (Interview 8)*

As regards coping with stress, the importance of teamwork and the support of the teacher were highlighted. Experiences related to the **learning process** included various learning opportunities, validation of skills in practice, and the relationship between theory and practice.

*‘It is one thing what you know and think about in theory, but when it’s put into practice, you notice the kind*

**Table 4.** Acquisition of skills and learning outcomes by the students in simulation studies

Subcategories	Categories
Experiences related to cooperation	Experiences related to professional development
Personal experiences	
Experiences of coping with stress	
Experiences related to time resources	Experiences related to the learning environment
Experiences with the simulation technique	
Experiences related to the nature of the simulation	
Different learning opportunities	Experiences related to the learning process
Consolidation of skills in practice	
Connections between theory and practice	
Interventions in different periods of childbirth	

of weaknesses that you should fix in your practical activities...’ (Interview 7)

Regarding the **learning environment**, the students emphasized that while the entire simulation should be regarded as a play, it still gives a good idea of how to deal with a patient in real life.

‘Certainly, real life is something else, like there’s no blood here... definitely worse in real life, but it gives at least some idea of what needs to be done...’ (Interview 3)

According to the students, the simulation made them feel more confident when they started practical training, and the acquisition of various learning outcomes through this learning method was very successful. Through manual activities, students were able to consolidate various procedures and actions, as well as analyse their own and others’ performance. In the course of simulation studies, students learned to use previously acquired theoretical knowledge in a new situation and establish connections between theory and practice. The students highlighted that, thanks to the simulation, the theoretical part was also better consolidated, since the learned material could actually be practiced in a safe environment. Giving feedback and watching the learning process were also considered important, as it provided the opportunity to learn from the mistakes of others. Although the students appreciated the chance to express their thoughts and discuss what was being taught during simulation learning, they rated their own participation as low. The opportunity to receive individual feedback and assistance in the form of guiding hints throughout simulation training and the clarity of how learning outcomes were achieved were assessed as low.

### 3.2.2. Quantitative results regarding students’ experiences

Participation in simulation learning and the achievement of learning outcomes was rated as good. Active participation in the post-simulation debriefing session was rated lowest (4.19; SD = 0.87) and the chance to work with peers during the simulation was rated highest (4.86; SD = 0.36) (see Table 5).

Twenty-three different students’ skill components were assessed by the Creighton Competency Evaluation Instrument. The skill components were divided into the following four knowledge areas: assessment, communication, critical thinking, and patient safety (Fig. 2). The lowest number of points was acquired for subjective and objective data collection (46 points) and the highest number of points for the knowledge gained from follow-up (89 points). In communication skills, the lowest number of points was acquired for communication with the patient (55 points) and the highest result was obtained for the correct use of terminology in communication (85 points). Students’ knowledge of clinical judgement showed the following results: the lowest number of points was for the evaluation of interventions (56 points) and the highest number of points for the interpretation of lab results (75 points). In the area of patient safety, the lowest result was for the safe administration of medication (25 points) and the highest result was obtained for hand hygiene and the utilization of various precautions (78 points).

The evaluation sheet helps to meet the learning goals set for simulation classes. It was thought that this instrument was better for evaluating the achievement of learning outcomes but that it also depends on the specifics

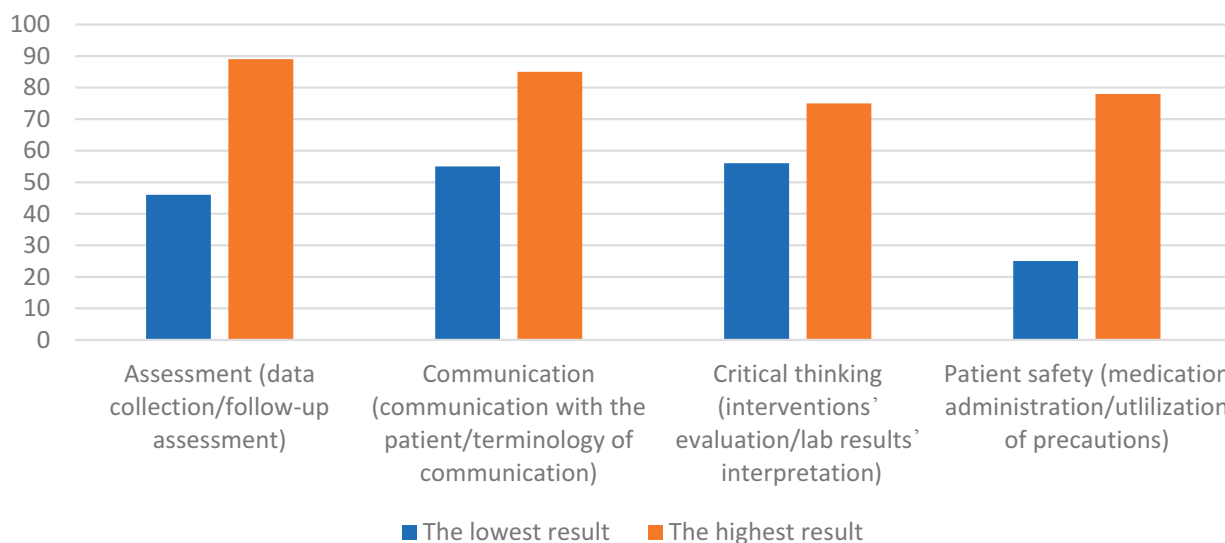


Fig. 2. Students’ skill components by the Creighton Competency Evaluation Instrument.

**Table 5.** Average ratings for the participation in simulation learning and the achievement of learning outcomes

Statement	Mean	SD	Min	Max
I had the opportunity during the simulation activity to discuss the ideas and concepts taught in the course with the teacher and other students.	4.62	0.59	1	5
I actively participated in the post-simulation debriefing session.	4.19	0.87	1	5
I had the opportunity to put more thought into my comments during the debriefing session.	4.48	0.75	1	5
There were sufficient opportunities in the simulation to find out if I understand the material clearly.	4.57	0.60	1	5
I learned from the comments made by the teacher before, during, or after the simulation.	4.62	0.59	1	5
I received cues during the simulation in a timely manner.	4.38	0.87	1	5
I had the chance to discuss the simulation objectives with my teacher.	4.45	0.61	1	5
I had the opportunity to discuss the ideas and concepts taught in the simulation with my instructor.	4.52	0.60	1	5
The instructor was able to respond to the individual needs of the learners during the simulation.	4.38	0.92	1	5
Using simulation activities made my learning time more productive.	4.52	0.75	1	5
I had the chance to work with my peers during the simulation.	4.86	0.36	1	5
During the simulation, my peers and I had to work on the clinical situation together.	4.85	0.37	1	5
The simulation offered a variety of ways in which to learn the material.	4.67	0.58	1	5
The simulation offered different ways of assessing my learning.	4.43	0.75	1	5
The objectives of the simulation experience were clear and easy to understand.	4.33	0.66	1	5
My instructor communicated the goals and expectations to be accomplished during the simulation.	4.42	0.77	1	5

of the subject. At the same time, it was noted that they would prefer to use the instrument in the clinical part of the simulation that contains disease-based situations, but the instrument needs to be adjusted to various situations.

**3.3. The impact of simulation learning on students’ acquisition of skills and learning outcomes in clinical practice**

The main category ‘The impact of simulation learning on clinical practice’ is formed of substantive codes, which were combined into nine subcategories, and the latter into three categories, covering the impact on the learning process, the effectiveness in implementing learning outcomes, and the organization of simulation training (Table 6).

*3.3.1. Impact on the learning process*

Student feedback confirms that the impact of the simulation learning course on clinical practice is rather positive.

‘... I think it’s very important to work through situations to do the right thing in practical training in the future...’ (Doc. 12); ‘... provided an opportunity to work through possible situations that also actually happened.’ (Doc. 22); ‘... without the simulation earlier, I probably couldn’t have done anything...’ (Doc. 34)

As a result of completing simulation training, performance stress decreased, knowledge was solidified, and self-confidence increased. ‘... simulation training gave me the necessary basic knowledge and certain courage to perform various actions. There was never the feeling that



**Table 6.** The impact of simulation learning on clinical practice

Subcategories	Categories
Impact on personality development	Impact on the learning process
Making connections	
Changing reality	
The ineffective effect of simulation learning	
Effectiveness in performing nursing interventions	Effectiveness in implementing learning outcomes
Effectiveness in providing nursing care	
Experiences with the simulation technique	Organization of simulation training
Experiences with the simulation environment	
Human and time resources	

*I had jumped into the deep end...* (Doc. 5); *'... when I completed simulation training, I definitely gained my first practical experience, which is why it was already easier to perform various procedures during my practical training...'* (Doc. 12); *'... I knew how to perform the actions... and... there was a clear order of actions and what things to use...'* (Doc. 52)

### 3.3.2. Effectiveness in implementing learning outcomes

In their feedback, most of the subjects referred to the positive impact of simulation learning in practising clinical nursing activities. Simulation training helped to solidify the theoretical knowledge previously gained in seminars/lectures and facilitated its application in the clinical environment.

*'... in practical training, it was easier to do a lot of things because they all had already been completed in simulation training...'* (Doc. 7); *'... since the activities had already been completed in simulation training, it was easy to try to do the same in practical training...'* (Doc. 15); *'... simulation was a good way to play out the theory in practice...'* (Doc. 27); *'... during practical training, it was good to remember the actions performed in the simulation. Practical training solidified this knowledge...'* (Doc. 18)

### 3.3.3. Organization of simulation training

The complex tasks previously performed during simulation training made it possible to deal with them better in practical training. At the same time, the students pointed to the distortion of perception of reality as a disadvantage,

as in clinical environments the situation is always more time-critical and decisions need to be made faster. Different situations may not follow the scenario that was practised, which can lead to confusion.

*'... thanks to the simulation, I didn't feel so much fear in practical training and I was more open...'* (Doc. 24); *'... simulation training helps not to be afraid to make actual...'* (Doc. 18); *'... it gave me more confidence and courage...'* (Doc. 26); *'... I wasn't so nervous in practical training...'* (Doc. 7); *'... without these, I wouldn't have felt so confident...'* (Doc. 12); *'... in real life, everything happened much faster than in the simulation...'* (Doc. 8); *'... in the simulation, our patient was calm, but when he began to scream and wail, I had not taken this into account, could not do anything ...'* (Doc. 17)

## DISCUSSION

As a result of this research, it was revealed that the teachers found high-tech simulation to be a necessary teaching method, highlighting the positive impact of the teaching method in terms of psychomotor skills and decision-making abilities of students, as well as the confidence that grows as the studies progress. At the same time, they were uncertain about the application of simulation learning, which manifests itself in the development of learning skills on the same level for all students. The quality of teaching is demonstrated by how much students are able to understand what they have learned and how they can build new knowledge on that information. However, interest in developing the structure

of thinking should be expressed by the learner, for the teacher it is important to take into account learning styles, learning habits, and the learner's level.

The teachers found the high-tech simulation to be resource-intensive, which made it problematic to involve all students in the learning process. Alshehri et al. (2023) confirm that limitations in simulation training include resources that are involved in making quality learning accessible to a large number of students. It is likely to partly depend on the preparation of teachers; on the other hand, it can also be seen as a wider problem of the organization of studies due to the lack of staff, which has in a way created a closed circle. The aforementioned problem has also been raised in previous industry-specific studies (Nehring et al. 2013; Herlihy 2022; Tamilselvan et al. 2023).

The impact of simulation training on learning outcomes was primarily reflected in the improved ability to make connections and the possibility to consolidate theoretical knowledge. At the same time, the teachers highlight the positive impact of the teaching method primarily in terms of the development of students' manual skills, but also in terms of increasing self-confidence and decision-making ability as studies progress, thereby conditionally supporting the respective claims in literature (Shin et al. 2015, 179; Cant and Cooper 2017, 68; Hussein and Favell 2022; Graham et al. 2023).

The results of this study revealed that students appreciated the opportunity to practise clinical skills in a safe environment, the opportunity to collaborate with fellow students, the experience of teamwork, and their wider professional development through the entire simulation course. The disadvantages of simulation learning included the application of video review, the lack of clarity about the achievable learning outcomes, and the limited possibility for students to receive individual feedback. Students feel insecure and anxious when they have to perform in front of other students. According to Teixeira et al. (2015), students are less anxious when no one is watching them and commenting on their performance. Herlihy (2022) has stated that better preparation led to better performance, decreased anxiety and growth of students' confidence. Also, as a result of this research, it was found that the subjects had experienced anxiety and stress in relation to the simulation, worrying about the judgments by teachers and classmates. The experience gained in simulation training was reflected in the clinical environment by coping better in stressful situations. The encouraging experience gained reduced performance stress in clinical practice, revealing the increased competence and confidence acquired during simulation training. Teixeira et al. (2015) also highlight that students who completed the simulation considered the situations therein to be realistic, and thus their fear of helping a patient in a real-life situation was reduced.

Aqel and Ahmad (2014), Hussein and Favell (2022) recognize that simulation training contributes to critical thinking and the acquisition of knowledge and skills. In addition, it is highlighted that constant practice contributes to better learning outcomes. Zitzelsberger et al. (2017) reached a similar conclusion, indicating that thanks to simulation, students acquire the knowledge required for safe and ethical nursing. At the same time, this study revealed that playing through simulation learning situations distorted the students' perception of reality in the clinical environment, creating misconceptions about the duration of the case-based process. The results of the study revealed that the students rated very highly cooperation with fellow students. It is important to learn from each other. In a study conducted in Norway, the highest rating was given to the simulation activities and the variety of ways simulation offered, which made learning more productive (Reierson et al. 2020), but it was not rated so highly in this study.

Earlier research (Rutherford-Hemming et al. 2016; Hussein and Favell 2022; Alshehri et al. 2023; Sterner et al. 2023) as well as this study showed that it would be most effective to integrate simulation learning throughout the curriculum. In putting the results of this research into practice, a questionnaire on students' skills and knowledge has been introduced at the beginning and at the end of simulation training, which allows us to conduct research based on data and clear-cut information about the learning benefits for the future. Considering all aspects, the concept of simulation learning has been adapted. Different ways have been used to evaluate and receive feedback, but currently, the most effective and positive feedback has been peer assessment.

This topic has been previously studied in other countries (Alshehri et al. 2023; Sezgin and Bektas 2023; Tamilselvan et al. 2023), but there is no information about the impact of simulation training on pre-clinical and clinical practice in the Estonian context. The present research differs from previous research in that the impact of simulation learning has been studied from the perspective of both teachers and students and both qualitative and quantitative research methods have been used. Research of similar length and diversity has never been carried out in Estonia before. Its length and diversity have great value. The current study is necessary first and foremost for simulation centres that are starting their work, in order to stay up to date and possibly prevent the problems highlighted in the research. The experiences of lecturers and students related to the application of this methodology emphasize its specific features and are essential for lecturers starting to use simulation training. The results of the research demonstrated the importance of being informed beforehand.

According to Sezgin and Bektas (2023), interprofessional simulation training is a suitable method to improve teamwork and communication between healthcare students. Future vision demands individualization of simulation training programmes for different specialties, depending on the healthcare students' cultural differences and social-demographic characteristics, and planning of long-term research (Sezgin and Bektas 2023). Participative and inclusive culture and a clear professional development structure are both vital for sustainable professional development of simulation (Pannekoeke 2023).

## 5. CONCLUSIONS

As a result of this research, it can be argued that simulation learning contributes to the achievement of students' learning outcomes and plays a major role in the professional development of the student. It was also observed that the effectiveness of simulation learning is influenced by the teacher's own competence in simulation learning and the students' previous practical experience in a clinical setting. When planning the learning process of simulation learning in the future, the need for video review is worth considering, and since the learning process is innovative and develops transferable competences, special attention should be paid to the learning process of students through individual feedback.

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## Simulatsioonõppe mõju prekliinilisele ja kliinilisele praktikale Tallinna Tervishoiu Kõrgkooli näitel

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Simulatsioonikeskkond ja ülitäpsed simulaatorid seavad õppejõududele uued väljakutsed. Simulatsioonõppe positiivne mõju õpilaste teadmiste ja oskuste arengule leiab kinnitust, kuid vähe on uuritud tegureid, mis on soorituse võtmelementid. Uurimistöö eesmärk oli hinnata simulatsioonõppe mõju õpilaste oskuste ja õpitulemuste omandamisele eelkliinilisel praktilisel ja tegelikus töökeskkonnas. Uurimistöö on empiiriline ja kirjeldav, kasutades kvalitatiivseid ja kvantitatiivseid meetodeid. Töö tehti 2017–2018 aastail ning jätkus 2019–2021.

Valim koosnes teise kursuse üliõpilastest ja õppejõududest, kellel oli simulatsiooni õpetamise kogemus. Viidi läbi poolstruktureeritud intervjuud kõrgkooli õppejõudude ja 16 üliõpilasega. Kasutati õppepraktikate küsimustikku *Educational Practices Questionnaire* (EPQ) (78 üliõpilast) ja *Creighton Competency Evaluation Instrument* mõõdikut (83 üliõpilast) ning hinnati 138 tudengi praktika dokumentatsiooni. Intervjuude ja dokumentide analüüsimisel kasutati kvalitatiivset sisuanalüüsi meetodit ning kvantitatiivseid andmeid analüüsi kirjeldava statistika meetodil. Simulatsioonõppe mõju hindamine visualiseeriti *Kirkpatrick's (2006) Four-Level Training Evaluation Model* hindamismudeli alusel. Antud õpimeetod parandab seoste loomise ja teadmiste kinnistamise oskust ning aitab tulla stressirohkete kliiniliste olukordadega.

Negatiivsetest aspektidest kerkisid esile videokriitika õppemeetodi elementina, õpitulemuste ebaselgus, piiratud individuaalne tagasiside ja tegelikkuse moonutamine kliinilises keskkonnas. Simulatsioonõppe efektiivsust mõjutavad õppejõudude pädevus ja üliõpilaste eelnev kogemus kliinilises keskkonnas.