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Engagement Enhances Well-Being in Simulation-Based Healthcare Education

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Abstract

There is no previous studies focused on student engagement and well-being within healthcare education. The aim of this study is to examine connection between student engagement and well-being in order to better understand their role in simulation-based learning environments. The specific aim is to answer the following research question: How does engagement enhance well-being in simulation-based healthcare education from the student's own perspective? The data were collected from Stanford University from 2010–2016 using pre- and post-questionnaires before and after the courses. This study had 239 participants. The data were analyzed using descriptive statistics as well as correlations, sum variables, a paired sample *t*-test, factor analysis, Cronbach's alpha, and regression analysis. The results show that student engagement and well-being correlate in a statistically significant way; the more engaged the students are, the better their subjective well-being is from their own view.

Keywords: Emotions, engagement, well-being, simulation-based learning environment, healthcare education

Introduction

Simulation-based learning environments (SBLEs) are experiential; they are considered safe learning environments that are used to rehearse the competencies of future healthcare professionals. The research about SBLEs has increased rapidly, and their prevalence has increased correspondingly (Chakravarthy et al., 2011). Previous research has shown that using simulations can enhance students' meaningful learning experiences (Brewer, 2011; Keskitalo, Ruokamo, & Gaba, 2014), enhance learning (Konia & Yao, 2013) and achieve safer patient care (Cook et al., 2011). Prior research has also provided notable evidence that students enjoy simulation-based education (e.g., Brewer, 2011). Many students have described it as a fun, experiential, and safe way to learn. Other studies have demonstrated that the addition of emotional stressors to increase participant anxiety may be educationally advantageous, enhancing the outcomes of simulation-based healthcare education (DeMaria et al., 2010).

Medical education, including simulation-based teaching and learning, involves various feelings and emotions that influence how students learn and transfer knowledge and skills to new settings. However, most of the literature on emotion in the field focuses on negative emotions (McConnell & Eva, 2012; Mosley et al., 1994) such as stress (e.g., Alinier, Hunt, Gordon, & Harwood, 2006; Andreatta, Hillard, & Krain, 2010; Stecker, 2004) or burnout (Dyrbye & Shanafelt, 2016) – despite the fact that positive emotions are associated with a broader cognitive focus, and lead important experiences for medical trainees (e.g., Duffy, Lajoie, & Lachepelle, 2016). The role that emotions play in learning is relatively unexamined in the literature on professional healthcare education (Duffy et al., 2016; McConnell & Eva, 2012). In addition, no earlier studies have concentrated on correlation between student engagement and well-being in healthcare education, despite widespread interest in

this correlation in other fields, such as education (e.g., Heikkilä, Lonka, Nieminen, & Niemivirta, 2012; Tuominen-Soini, Salmela-Aro, & Niemivirta, 2012). In this study, we attempt to bridge this gap. The purpose and aim of this research is to address the correlation between engagement and well-being in simulation-based healthcare education. It is important for healthcare educators to develop a deeper understanding of the effects of various emotions related to education, because student engagement may result in more sustained learning and greater learning achievements (e.g., Kahu, 2013; Pittaway, 2012), as well as increased well-being in students (Lonka & Ketonen, 2012).

Engagement, Well-Being, and Their Relationship to Simulation-Based Learning

Engagement

Previous research has explored engagement from various theoretical perspectives (e.g., Pittaway, 2012), but no research has thus far examined student engagement in simulation-based healthcare education. Engagement is one of the key focus areas in higher education because many researchers have concluded that it enhances learning (e.g., Lonka & Ketonen, 2012). Broadly, engagement is defined by the energy, resources, and amount of time devoted to learning; high levels of these enable deeper and more sustained learning, and thus higher-quality learning outcomes. Pittaway (2012) has developed a framework for engagement that can be applied in various disciplines. This framework is divided into the categories of personal, academic, intellectual, social, and professional engagement, all of which are important elements for defining engagement. Personal engagement is necessary: Medical students bring their expectations, experiences, assumptions, knowledge, and skills to bear on the simulation-based learning situation. They engage academically via their particular academic qualities and skills, some of which they already possess while others are developed during simulation-based learning. Medical students play an active role in simulation-based learning and as such should be able to plan, monitor, and evaluate their own learning processes (cf. Scevak & Cantwell, 2007). Medical students also intellectually engage with the ideas, concepts, and social, moral, and ethical issues of simulation-based healthcare education (cf. University of Melbourne, 2007). They ask questions while remaining aware of their own cognitive strengths and weaknesses and decision-making processes during simulations; likewise, they remain open minded to the views of other students and facilitators. During simulation-based learning, students are socially engaged as well: They work in groups and get to know other students, facilitators, and staff involved in the simulations (cf. Vaughan, 2010). Lastly, professional engagement here refers to the professional experiences and connections medical students make while collaboratively learning with other students, facilitators, and staff involved in simulation-based learning approaches. Pittaway's framework can be used for understanding, supporting, and enhancing the engagement of both students and facilitators (Dyment, Downing, & Budd, 2013; Pittaway, 2012).

Engagement is also related to self-efficacy, a quality which can lead to higher achievement (Linnenbrink & Pintrich, 2003). Engagement can be considered a process consisting of three interconnected stages: interest, motivation, and engagement (Renninger & Bachrach, 2015; Renninger & Hidi, 2011; Renninger & Järvelä, 2014). Schaufeli, Martínez, Marques-Pinto, Salanova and Bakker (2002, p. 465) define engagement as "a positive, fulfilling and work-related state of mind that is characterized by vigor, dedication and absorption." In this research, engagement is defined as healthcare students' emotional, behavioral, and cognitive involvement in simulation-based learning, as well as their expectations of, and experiences with, simulation-based learning processes (cf. Kangas, Hyvönen, Randolph, & Ruokamo, 2017).

Well-Being

There has been plenty of research on well-being in different disciplines and some earlier research on healthcare students' well-being, too (Mavor & McNeill, 2014; Mosley et al., 1994; Stecker, 2004). Well-being has been studied in various research traditions, resulting in different definitions of the term. Hascher (2010, p. 99) spoke about subjective well-being (SWB) and presented three aspects of its conceptualization: (a) a specific emotional quality of feeling well; (b) a supra-term for positive emotions like enjoyment, pride, satisfaction, etc.; and (c) a multidimensional concept that combines cognitive and emotional factors. These definitions all include enjoyment and happiness as core elements. SWB usually refers to a subject's evaluations of their own feelings.

In this research, we adopt Hascher's definition to consider healthcare students' feelings and evaluations of their expectations and experiences in simulation-based healthcare education. SWB can be defined by both positive and negative dimensions; the greater the difference between the positive and negative dimensions, the higher the SWB (Hascher, 2010). In our previous study, we divided students' emotions into positive and negative categories using factor analysis and reliability tests (Keskitalo & Ruokamo, 2017). For the present study, we selected some of these positive emotions to represent specific emotions of medical students, in order to qualify the students' subjective well-being. We will present the selected emotions later in this paper.

SWB can be explored from either a short- or long-term perspective. In this case, our focus is on short-term SWB, which deals with the expression of current positive emotions and cognitions regarding simulation-based learning situations. Short-term well-being can be defined by for example, expressing experiences of enjoyment, feelings of competency, and mastery of academic challenges (Hascher, 2010). In this research, short-term well-being is defined by students' own expressions of positive emotions in simulation-based healthcare education.

Simulation-Based Teaching and Learning

In much of our previous studies we have used the term "simulation" as defined by Rall and Dieckmann (2005) within healthcare. According to the authors:

> Simulation, in short, means to do something in the "as if"", to resemble "reality" (always not perfectly, because then it would be reality again), e.g., to train or learn something without the risks or costs of doing it in reality" (p. 2).

Many SBLEs utilize simulators, which are computer-driven, life-size plastic manikins with many of the attributes essential for learning and which, according to DeMaria et al. (2010, p. 1007) can facilitate "'true-to-life' experiences for learners." Mannequins simulate human experiences, which allows the students to practice. An example of a high-fidelity simulation (for more information about fidelity, see Tun, Alinier, Tang, & Kneebone, 2015) can be seen in Figure 1.

Figure 1. Simulation-based learning environment

In our research, we focused on SBLEs because we wanted to emphasize the potential purpose of technologically rich and safe learning environments. These environments – considered as complex cultural, social, physical, and pedagogical (Keskitalo, 2015; Keskitalo & Ruokamo, 2017) – play an important role in student engagement and well-being.

In SBLEs, scenarios are usually constructed to elicit particular emotions, especially for healthcare professionals (DeMaria et al., 2010), because real-life situations in a healthcare environment might be challenging, stressful, or cause cognitive overload (e.g., Andreatta, Hillard, & Krain, 2010). The aim of adding an emotional component is to both enhance learning and improve recall of experiences and information later on (e.g., DeMaria et al., 2010). However, for early learners, lower-fidelity simulations might be more beneficial and comfortable (Brady, Bogossian, & Gibbons, 2015). In general, the higher the fidelity of the simulation, the more advanced and skillful the learners must be to benefit from the simulation (Alinier, 2011). As Fraser et al.'s (2012) study suggested, learners with limited clinical experience have a higher cognitive load during simulation-based training, which may hinder their learning, and thus additional distractors may not be beneficial. On the other hand, simulation-based learning challenges students to suspend their disbelief – in other words, to engage with scenarios – and reflect on their emotions and reactions, as well as to consider the influence of simulation on learning and work practices (Dieckmann & Rall, 2007; Keskitalo, Ruokamo, & Väisänen, 2010).

In this research, we focused on students' engagement and well-being, and the following research question was addressed: How does engagement enhance well-being in simulation-based healthcare education from the student's own perspective?

Methods

Empirical data were collected from students (N = 239) using pre- and post-questionnaires at two different simulation centers at Stanford University from 2010–2016. The pre-questionnaires were measuring students' expectations dealing with simulation-based learning (SBL) and post-questionnaires were measuring students' experiences with SBL. The questionnaires distributed to students (N=239) at the beginning and end of the courses, respectively. Students' (122 males, 116 females) pre- and post-questionnaires were analyzed using statistical methods. The subjects were anesthesia and emergency residents (N=119), as well as medical students (N=100) studying anesthesia, crisis resource management, emergency medicine, or who were in anesthesia clerkships, and other healthcare practitioners (N=17). The median age of the respondents was 29 years old; the youngest respondent was 22 years old, and the oldest was 39 years old. Before the study commenced, the research was approved by the institutional review board and consent was obtained from the participants (cf. Keskitalo & Ruokamo 2016).

Most of the students had undergone simulation-based learning before (one session, 8.9%; two sessions, 6.1%; three sessions, 8.3%; more than three sessions, 56.7%). Only 9.4% of the students had no prior experience with simulation-based education. All of the students who took part in the simulation courses also voluntarily participated in the present study. The courses were chosen for use in this study based on whether they ran during the three research periods at Stanford University, and whether they were accessible to the researchers. The courses lasted from three to nine hours. During the courses, all activities were completed in groups that were arranged by the facilitators. During the simulation scenarios, one student was chosen to act as a leader (the "hot seat" position) and called on others to help. Students not taking part in the scenario watched from a separate room on a television.

The pre-questionnaire consisted of 52 Likert-type questions related to students' expectations for the teaching and learning processes in a simulation-based environment. Each of the responses was given based on a continuum (1 = does not describe my expectations at all; 5 = describes my expectations very well). 29 Likert-type questions (1 = not at all, 5 = to a great extent) focused on the emotions students experienced during the course (cf. Keskitalo & Ruokamo 2016). In this study, we focused on the questions that measured students' emotions, dividing the emotions into two sum variables: engagement and well-being. Before and after the course, the students were asked to evaluate the degree to which they felt a given emotion (e.g., enjoyment of studying, boredom, sense of community, etc.).

In addition to Likert-type questions five questions were aimed at collecting students' background information, and one open question gave students the opportunity to write other comments. The post-questionnaire questions were similar to those in the pre-questionnaire, but dealt with students' experiences immediately upon the course's completion (cf. Keskitalo & Ruokamo 2016). A detailed description of the development and usage of these questionnaires can be found in Keskitalo's (2012) article. The data were analyzed using descriptive statistics, sum variables, correlations, factor analysis, and Cronbach's alpha. The paired sample *t*-test was used to compare the differences between students' emotions before and after the course (Keskitalo & Ruokamo, 2017). In addition, we used multiple linear regression analysis to explain variations in engagement and well-being.

Results

In this study, we selected students' reported positive emotions to identify their engagement and well-being. Table 1 presents students' positive emotions before and after simulation-based education.

Table 1
Means, Standard Deviations, and Statistical Significance of Differences in Students' Positive Emotions Before and After the Simulation-Based Course (adapted from Keskitalo & Ruokamo, 2017)

Emotions	***Before the course (pre-questionnaire) M (SD)***	***After the course (post-questionnaire) M (SD)***	***p-value***
Interest	4.05 (0.82)	4.32 (0.77)	.000
Sense of community	3.69 (0.95)	4.19 (0.85)	.001
Enjoyment of studying	3.76 (0.95)	4.29 (0.84)	.000
Enthusiasm	3.72 (0.87)	3.89 (1.00)	.034
Hopefulness	3.72 (0.97)	3.89 (1.11)	.037
Feelings of challenge	3.55 (1.06)	3.81 (1.07)	.003
Cheerfulness	3.33 (0.91)	3.55 (1.04)	.009
Satisfaction	3.24 (1.01)	3.82 (1.00)	.000
Happiness	3.12 (0.98)	3.43 (1.09)	.000
Activity	2.96 (1.12)	3.36 (1.21)	.000
Feelings of relief	2.32 (1.03)	3.08 (1.22)	.000

The three most prevalent positive emotions at the beginning of the course were interest (M = 4.05, SD = 0.82), sense of community (M = 3.69, SD = 0.95), and enjoyment of studying (M = 3.76, SD = 0.95). Interest (M = 4.32, SD = 0.77), sense of community (M = 4.19, SD = 0.85), and enjoyment of studying (M = 4.29, SD = 0.84)

were also the most positive feelings at the end of the course. Students' interest (p = .000), sense of community (p = .001), and enjoyment of studying (p = .000) showed a statistically significant increase when compared before and after the course using a t-test. Relief was the least experienced positive feeling (M = 2.32, SD = 1.03) before the course, but had statistically significantly increased (p = .000) at the end of the course (M = 3.08, SD = 1.22). The other statistically significantly increased positive emotions were satisfaction (p = .000), activity (p = .000), happiness (p = .000), and feelings of challenge (p = .003) (see also Keskitalo & Ruokamo, 2017).

We further classified positive emotions to describe engagement and well-being as follows: (a) engagement consisting of interest, sense of community, enjoyment of studying, enthusiasm, feelings of challenge, and activity; and (b) well-being consisting of hopefulness, cheerfulness, satisfaction, happiness, and feelings of relief (Keskitalo & Ruokamo, 2017). Based on these classifications, we formed two sum variables: engagement and well-being. Cronbach's alpha values of engagement (α = .715) and well-being (α = .743) were acceptable (Nunnally, 1978), indicating that internal consistency was sufficient, and hence, that our measurement was reliable. Both engagement and well-being were also statistically significantly increased at the end of the course (see Table 2).

Table 2
Means, Standard Deviations, and Statistical Significance of Differences in Students' Engagement and Well-Being Before and After the Simulation-Based Course

Emotions	***Before the course (pre-questionnaire) M (SD)***	***After the course (post-questionnaire) M (SD)***	***p-value***
Engagement	3.63 (0.63)	3.97 (0.65)	.000
Well-being	3.16 (0.69)	3.54 (0.78)	.000

There were also statistically significant correlations between engagement and well-being before (r = 0.717, p = 0.000) and after the course (r = 0.735, p = 0.000) (see Table 3).

Table 3
Correlations (Pearson) of the Sum Variables of Engagement and Well-Being

		Engagement
Well-being	Pearson Correlation	.717 - .735
	Sig. (2-tailed)	.000
	N	232
**. Correlation is significant at the 0.01 level (2-tailed).		

Based on these analyses, we can argue that the more engaged the students are, the better their subjective well-being is.

For the multiple linear regression analysis we formed sum-variables from individual items, namely, "Others' opinions of me as a learner and physician" (α = 0.80), "goal-oriented studying" (α = 0.76) and "challenges of the course" (α = 0.73). In addition, the sum-variables "engagement" and "well-being" were used in multiple linear regression analysis, which showed that students' "well-being" (t = 13.23, p = 0.000) and the "challenges

of the course" (t = 7.53, p = 0.000) explained most of the variation in participants' engagement after the course (R^2 = 0.604), whereas "engagement" (t = 11.93, p = 0.000) and "goal-oriented studying" (t = 3.71, p = 0.000) explained the variations in participants' well-being (R^2 = 0.533).

Discussion and Conclusion

The results of our earlier study showed that simulation-based healthcare education produces mainly positive emotions that increase after the course (e.g., Keskitalo & Ruokamo, 2017), which is consistent with the results of other studies (e.g., Schlairet et al., 2015). In the current study, we focused on student engagement and well-being, as there were no studies on these topics within simulation-based healthcare education, despite it being an important topic for medical students and clinicians (Hill, 2017; Lonka & Ketonen, 2012; Muller, 2017). Student engagement is one of the key focus areas in higher education (see for example Lonka & Ketonen, 2012; Tuominen-Soini et al., 2012); it has been shown to enhance learning. This study showed that there is a positive correlation between student engagement and well-being. The more engaged students feel, the better their perceptions of their own well-being. Engagement explained students' well-being and vice versa, which confirms the results of previous studies (e.g., Lonka & Ketonen, 2012).

This study demonstrates that student engagement and well-being in simulation-based healthcare education is worth considering because, by affecting engagement, we may also increase the short-term subjective well-being of students. During their medical training and in future careers, students will confront many challenges and stressful situations, and even burnout (Dyrbye & Shanafelt, 2016); thus it is necessary to support their well-being (cf. Hill, 2017; McConnell & Eva, 2012; Muller, 2017). According to Mosley et al. (1994), well-being in the medical profession is of particular concern because physicians have higher rates of mental illness, chemical dependency, and suicide (see also Hill, 2017). It is important for healthcare educators to develop a deeper understanding of the effects of engagement on student well-being in order to further support their learning and educational experiences, and consequently, their well-being. As Lonka and Ketonen (2012) explained, it can be difficult for the educator is to find a balance between flow and anxiety. Overall, our results show that simulation-based learning environments can create good conditions and evoke positive emotions, which may in turn lead to enhanced learning and performance (Damasio, 2001; DeMaria et al., 2010; McConnell & Eva, 2012; Schwabe & Wolf, 2009) as well as enhanced well-being.

In the future, it would be interesting to more comprehensively examine emotions, engagement, and well-being in this context, as we acknowledge that their relationship is far more complex than presented in this study. Qualitative methods such as interviews or diaries might be useful. It would also be interesting to explore in more detail how positive emotions, engagement, and well-being are connected to academic success in simulation-based learning environments. Moreover, the relationship between engagement and well-being must be explored in greater detail through other statistical and qualitative methods. In the near future we will analyze the other data – video recordings, observations by researchers, and student and facilitator interviews – we collected during 2010–2016. We will conduct further research on the basis that we are interested in discovering whether other variables show a more detailed correlation between student engagement and well-being.

Our earlier study provided some understanding about the emotions of medical students before and after simulation-based education, as well as how these emotions develop (Keskitalo & Ruokamo, 2017). This study has shown that there is relationship between engagement and well-being. In other words, subjective feelings of wellness and challenges set by the course allow students' interest, enthusiasm and engagement to grow, and this growth and corresponding goal-setting feed the students' well-being. These results should be applied to simulation-based teaching and learning in order to improve and develop healthcare education: the greater the student engagement, the better they will feel, and the better the results of their learning will be. Improved learning results may contribute to better outcomes for both educational and healthcare organizations, and could also have a positive effect on real-life situations outside these organizations (cf. Dyrbye & Shanafelt, 2016).

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