

ORIGINAL ARTICLE

# From fairies to SimMan: Tolkien and realism in simulation

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## Abstract

**Background:** There is a paucity of empirical and theoretical literature on reality and realism in simulation-based learning. **Methods:** This article makes an original contribution to the body of literature by using the theoretical conceptualizations of reality described by Dieckmann et al. in simulation and by the fantasy author and scholar J.R.R. Tolkien to challenge and develop our understanding of reality in simulation. This article reports a qualitative research study that reveals the perceptions of realism in simulation-based medical education. **Results:** A significant finding was the importance participants placed on realism in their motivation to participate in simulation. Participants' descriptions of realism were consistent with the domains of physical, semantic and phenomenological realism and played an important role in their intention to participate in simulation-based learning. The data also revealed that while lapses in physical realism were tolerated, lapses in semantic realism were very poorly tolerated. In addition, when there was inconsistency within the secondary reality as described by Tolkien, this resulted in a breakdown of suspension of disbelief. **Conclusions:** A deeper understanding of these factors will inform course designers as they consider the processes of simulation-based learning and as they seek robust evidence for its effectiveness. Developing understanding of realism for medical simulation can help course designers and teachers make best use of resources by focussing on the domains of realism that have most impact on learners.

**Keywords:** *simulation; theory; reality*

## Introduction

There has been a dramatic increase in the use of simulation-based education (SBE) in medical and surgical training over the past three decades. In parallel with this, there has also been an increase in the published literature relating to SBE. Much of the literature has, however, been criticized for being too descriptive, lacking in methodological robustness or lacking theoretical underpinning. This is particularly true when considering realism. Much of the research and literature focusses on describing ways to enhance realism, despite the argument that that more (physical) realism does not necessarily lead to better learning.<sup>1</sup> Although several authors have classified simulators and simulations in terms of fidelity,<sup>2,3</sup> there is a paucity of literature exploring the construct of realism in SBE in a way that enhances understanding of the phenomenon. There is even less research in the field that develops, tests or challenges the underpinning theory of realism.<sup>4,5</sup> However, Dieckmann et al.<sup>6</sup> have made an important contribution in this area in their work on

developing a theory of immersion and engagement with simulation-based learning, both at the level of the individual practitioner and as a learning community. They explore what reality means in the context of a fully immersive simulation experience. The nature of reality is a profound question of ontology and is beyond the scope of this article.<sup>7</sup> It is, however, clearly an important issue to address in any role play or simulation as the degree of engagement, or immersion into the created world of simulation, will have a profound impact on the nature and quality of learning. Dieckmann et al.'s theoretical framework, based on empirical research using interviews and video analysis of high-fidelity immersive simulation behaviour, is outlined and discussed and compared with other conceptual frameworks from entertainment and fiction, and used as a launch pad for analysis of the author's own qualitative research exploring SBE.

Dieckmann et al.<sup>6</sup> proposed that immersive simulation is essentially a social activity and a social learning experience

The results of this study were presented at the Fifth Annual Homerton Simulation Conference: Innovations in Healthcare, Patient Safety and Simulation, Homerton University Hospital, London, UK, on 10 December 2015. This invited article forms part of a special issue devoted to the conference and has been accepted for publication after peer review by the Guest Editor and an external reviewer.

and have compared it with immersive experiences in entertainment. Their conceptual framework for reality is based on three domains of physical, semantic and phenomenological realism. Physical reality refers to the properties of the simulation that can be sensed or are measurable, through sight, sound or feel; for example, a blood pressure recording, a lab result, heart sounds on auscultation. The physical realism domain considers the question “Does this look, sound or feel like the real thing?” Semantic realism addresses the question “Would it happen like this in the real world?” This refers to issues of sequencing, timing, changes in physiological parameters, availability of help when required, or the roles played within teams and the degrees of expertise exhibited. The third domain of realism is phenomenological. This refers to how the participant feels and experiences the simulation. It addresses the question “Does this feel the same as the real situation?”

Dieckmann et al.’s work suggests that semantic realism is more important to participants than physical realism. These three domains of realism are summarised in [Table 1](#).

Another helpful insight can be gained from a different context that can be considered analogous to simulation; that is, the entertainment industry. This is helpful both in terms of a language of realism and also conceptualization. The terminology of “suspension of disbelief” is very helpful. An audience deliberately choose to suspend their disbelief for the purposes of entertainment. It is suggested that there is a conceptual contract between consumer and director in relation to suspension of disbelief. The audience choose to believe that the fiction created is “real” even when they “know” it is a fictional representation. Curiously, there are occasions when suspension of disbelief breaks down: a consumer may go to a cinema with friends to watch a historical fiction movie in which the audience choose to suspend disbelief for the purpose of enjoyment. If, however, the audience then see a piece of modern technology, for example, an electricity pylon, which is inconsistent with the historical period, it can cause a temporary break in the suspension of disbelief. In

an essay “On Fairy Stories”,<sup>8</sup> the famous author of fantasy J.R.R. Tolkien discusses the creation of fantasy kingdoms in relation to reality; he introduces the idea of primary and secondary realities. The primary reality is sitting in a comfortable seat, alone or with friends, reading a book or watching a movie for entertainment, escape or relaxation; the secondary reality is the other world or kingdom created as a fictional entity entirely by the author or director. The physical reality of a cinema, the furnishings, etc. have less impact on the overall value of the experience compared with the fictional content of the book or movie. Tolkien asserts that the characteristics of the secondary reality can be as creative, even as fanciful, as the author wishes, but stresses that the internal consistency of the secondary world is essential to the suspension of disbelief. This concept of primary and secondary realities provides a helpful framework for considering immersive simulation. As Tolkien’s conceptualization suggests, provided the created world, that is, the simulation, is internally consistent, then it can be as imaginative as the designer wishes and one can fully engage in the secondary reality. This article describes empirical, qualitative research that contributes to the literature by deepening understanding of reality in simulation as well as testing, challenging and developing existing theory even further.

## Materials and methods

Semi-structured group interviews were carried out with a range of medical students and doctors at different stages of their careers and from different professional groups including anaesthetists, general practitioners (primary care physicians) and foundation doctors. Participants described their experiences of simulation and what would motivate them to participate in SBE or what factors would be demotivating. All interviews were transcribed and coded for themes and subthemes using framework analysis.

## Results

The data revealed a range of simulation experiences including cardiopulmonary resuscitation (CPR) training, procedural training using part task trainers, use of simulated patients and complex immersive simulations. Several themes were identified, such as range of experiences, positive value perceptions, negative value perceptions, realism, relevance and pragmatic moderators to simulation. This article discusses one of these themes: realism. It was clear that reality was an important consideration in all groups. Realism is defined as the extent to which the simulation or simulator appears, feels and/or behaves the same as the real-life system. Although similar definitions are used of fidelity, this term is avoided first because of the variation in the

**Table 1** Dieckmann et al.’s three domains of realism

Realism Domain	Description
Physical	Can be measured, sensed; e.g. auscultatory heart sounds, vital signs on a chart
Semantic	Sequencing, timing, changes, roles and responsibilities consistent
Phenomenological	If the learner experience feels as it would in the real situation, stress, emotions, responses

numerous different definitions of use of the term,<sup>9</sup> and second, because it tends to be associated with simulations that involve technology and where low fidelity can imply lower realism or authenticity, when this is not necessarily the case. The term artificialness is used as the opposite of reality, in other words, the degree to which the look, feel, or behaviour of a simulation deviates from that of the real-life system, process or object.

The data revealed a great deal of subjective discussion about realism. There was contrast and contradiction in descriptions and narratives around realism. Artificialness or lack of realism was described in negative terms, in positive terms or in terms of tolerance of realism limitations. In order to give the reader insight into the qualitative data, a number of direct quotations are shown. For readers less familiar with qualitative methodology, the transcribing convention is shown in Table 2.

First, quotations are shown for negative value perceptions around physical realism. There were relatively few quotations about negative perceptions of physical realism, and most related to the use of part task trainers. There were no instances in the data where anaesthetic trainees mentioned physical realism as a negative perception.

GPF14: It [part task trainer] *looked* nothing like an arm, it *felt* nothing like an arm, so it wasn't that great

GPM2: I did a minor surgery course years ago which was using bits of plastic which weren't particularly good to be honest

FY1F1: I suppose there's a limit to how realistic models can be

**Table 2** Transcribing convention

Standard English grammar and punctuation for clarity of reading

Comma or question mark used to enhance readability

Short drop of voice, full stop

Pause in brackets, 1 s [.], 3 s [ . . ]

Emphasized words are in italic type

Notes and comments to add explanation or clarity in brackets []

Direct participant quotations indicated by indented text

GP, general practitioner; AN, anaesthetist; FY1, first year foundation doctor; UG, undergraduate

Gender M/F

Second, quotations showing the lack of semantic realism as a negative feature for participants, are shown. For this theme, most of the quotations were from anaesthetic trainees and undergraduates, and related to complex immersive simulation experiences.

ANF1: You get, the fidelity of it sometimes gets in the way of the learning [...] the blood pressure, the thing that's showing you the blood pressure is playing up or something and that can mess it up, [...] things that get in the way, like that kind of ruins it a bit you know if [...] you just have to pretend, like they go "right, right this is the real patient and this is the blood pressure" and things except for "if you're cannulating you get this arm out". *What?* You know you just, I realise that there are practical limitations and they're getting better and everything but little hitches like that or even the fact that when you pick up the phone and then you're told whenever you pick up the phone and you're dialling 2222 you say "2222" but you really dial 8911 or whatever, I mean I know that one's a particular one, you *cannot* have them really dialling 2222 I understand that, but these little things that are in the fidelity kind of emm can be a problem.

ANM1: It's just quite *artificial* sometimes, you don't act the way you think you normally would act.

ANF1: You've really got the real kit that [you] might use in real life, you're not pretending to put a cannula in, even that sort of stuff, the time-based stuff that that, eh often in the stuff when we can't really afford it, and we are just *pretending* [...] and it's not really a proper simulation, and you've just got a resus mannequin and then they say "right you've put a cannula in" and [...] you just say it and then it happens really quickly, so something that slows it down because in real life you actually get a lot of time to *think* in some ways, and then sometimes on simulator courses you don't because you don't have that time, you're putting the cannula in and that time that you're pre-oxygenating, they pretend you've pre-oxygenated in 20 seconds, whereas in *real life* you do it for 3 minutes and you time it and you do it *properly*. That kind of stuff. It's kind of important.

ANM2: I think one of the limitations with the high fidelity though is you're working within an environment [with] people who you may have just met that morning [...] You're taking on roles that [are] not necessarily reflective on your normal day to day, for example, you could have someone else who's the same stage as you [a] doctor in anaesthetics who's taking on the role as your nurse or whatever, who then without meaning to will *assist* you in

ways that wouldn't be forthcoming if that event actually arose.

UGF2: But I mean there's been a few scenarios when maybe emm, they haven't quite been realistic, like well no that actually wouldn't happen, emm in kind of the real in the real world.

Third, phenomenological realism was interesting in that there was tolerance of artificialness, and a comparison of stress, competition and scrutiny in simulation with the stress of real clinical practice particularly in the emergency situation.

GPF4: You just don't get that adrenaline kick, you might get the embarrassment kick and that's akin to it but you don't get the adrenaline kick type of thing.

ANM4: I think from the sort of the realism point if you don't get sort of caught up in the fact that "Oh your patient's gonna die" you at least get caught up in the fact that there's an element of competition there [soft laughter from other interviewees] and so you want to do well so you know you, you the stress is still there from the aspect of your wanting to do well.

ANM4: It's a different kind of stress but it at least simulates it in some way.

Fourth, the lack of reality or artificialness of the situation was acknowledged as a specific positive value perception: hyper-realism. This is the concept that a simulation can be slowed down or speeded up in a way that can enhance learning, and also that in simulation, precisely because it is artificial, participants can deliberately choose to make mistakes, choose to do things incorrectly in order to explore the limits of a skill or procedure or to understand the consequences of mistake making and to create boundaries of where correct techniques becomes error. Examples are shown below.

GPF4: You can do what you *like* to these things but you can't really do that to a human.

GPF5: You could also practice doing it *badly*, you know putting it in the wrong, putting it in too *deeply* and stuff, which is not what you want to do.

GPF5: So you can pull the skin back and look and see where it ends up [laughs]. It's quite clever.

FY1F1: I think it's a good opportunity to [be able to go] through the technique very slowly and thoroughly and fully explore what indications and contraindications would be.

FY1F1: Because when there's a real person there [real clinical situation] you're obviously quite anxious to do it well but it's [simulation] an environment where you can identify the potential pitfalls and *actually* sometimes almost deliberately make mistakes to see why it is.

Finally, quotations are shown demonstrating tolerance of artificialness; the view that although one knows the simulation is not real, this did not actually matter as the educational outcomes or goals were achievable.

GPF4: Well I don't think you can do CPR on anything *other* than a mannequin

GPF14: Of course it doesn't feel anything like a real body and it doesn't have the same flexibility but it's a good idea for just giving you training; more the closest thing you're going to get.

ANM3: I think you have to accept the artificialness.

ANM4: Although yeah a lot of people say "well I'm never going to believe that that's really a patient" I'm not sure how much that truly matters.

UGF2: You just kind of have to emm go with it because it's not the real world is it, it's a simulation.

UGM1: The models that are used for PR exams, that sort of thing emm are obviously not quite as realistic, but practically you aren't ever going to be able to practice these things on real patients all the time so, it is an effective model but it's because it's the most effective model we've got sort of thing.

## Discussion

From the quotations shown above, it can be seen that various levels or domains of realism are described. Although participants did not use a scholarly typology in their talk about realism, the types of realism described did align with the types of realism as discussed by Dieckmann et al.<sup>6</sup> The realism described was in terms of physical realism, whether the model or mannequin looked, felt or was empirically a close replication of the real thing. It can also be seen that the limitations of physical realism were accepted and tolerated as necessary, unavoidable, or even beneficial. It can also be inferred that as none of the anaesthetic participants mentioned limitations of physical realism that this feature is not important to this group. When participants went on to talk about semantic realism, this was different. It seems that semantic realism lapses are significantly less tolerated than physical reality breakdowns, and they were described in more negative terms.

It can be seen from the quotations above that general practitioners tended to emphasize the limitations of physical reality, whereas anaesthetists emphasized lack of semantic realism.

When considering artificialness or lack of realism, there was some tension and contradiction; in some circumstances the lack of realism was tolerated but in other circumstances, lack of realism was not tolerated by participants.

There was a negative value perception around realism as described above, but an acknowledgement of the lack of accessible, sustainable educational alternatives to gain the same skills or experience, particularly in rare and unusual emergency circumstances.

Using Tolkien's concepts of primary and secondary reality, it can be seen that the physical aspect of the primary reality was not important, but the physical limitations of the secondary reality were significant, in particular with reference to part task trainers. By and large, these limitations of realism were tolerated. In fact, sometimes artificialness in the secondary reality, hyper-reality, was considered beneficial. The results support the idea that internal consistency may be more important than greater degrees of realism.

Within the secondary reality, that is, the simulation, semantic realism issues were problematic for participants in immersive simulations. Typically issues around sequencing, timing of physiological changes, availability of help, and other people in team roles were not well tolerated.

## Conclusions

This article argues that a theory of realism in SBE derived from the work of Dieckmann et al. and Tolkien can deepen our understanding of the complex issues in engaging with simulation as well as encouraging simulation designers and teachers to consider the semantical reality and the internal consistency of simulation as well as the physical constructs. Understanding of and attention to detail in creating internal consistency within the secondary reality and semantical realism may lead to more effective engagement and

consequently better learning, as well as more cost-effective use of resources in simulation-based learning.

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## Conflict of interest

The author has no financial or personal conflict of interest.

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