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Motivational processes involved in simulation-based learning in teacher education: the perspective of Self-Determination Theory

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ABSTRACT

The study examines the motivational processes that take place within Simulation-Based Learning (SBL) in a teacher-education setting. The study is anchored in Self-Determination Theory (SDT), which focuses on psychological needs and ways to support them. We hypothesised that a need supportive climate would lead to a sense of need satisfaction, which in turn will contribute to autonomous motivation for participation in the simulation, which will foster a sense of simulation satisfaction and skills acquisition. The study subjects were 307 participants of a simulation workshop. Data was collected via validated questionnaires. Findings showed that a need supportive climate was positively correlated with a sense of need satisfaction, autonomous motivation, skills acquisition, and sense of simulation satisfaction; and negatively correlated with a sense of need frustration. SEM analysis confirmed the research hypothesis. Need satisfaction and autonomous motivation partially mediated the association between a need supportive climate and the outcome variables. The study highlights the importance of supporting participants' psychological needs in SBL.

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Autonomous motivation; psychological needs; Self-Determination Theory–SDT; simulation-based learning; teacher education

Introduction

Teacher training institutions have established simulation centres to prepare future teachers to cope with the complexities of school reality, improve their capacity to handle conflictual situations, and develop their social, emotional, and communication skills (Levin 2021). *Simulation* is a general term for various learning methods that mimic complex events occurring in the real world, allowing learners to experience these events in a protected environment (Yablon, Iluz, and Eizenhamer 2022). Different models of simulation exist; the current study focuses on clinical simulations. A clinical simulation takes place face-to-face with a professional actor, is based on a planned scenario, and is followed by a discussion accompanied by video recording, allowing for reflection and meaningful learning (Levin, Frei-Landau, and Goldberg 2023).

The study examines clinical simulations from the perspective of Self-Determination Theory (SDT; R. Ryan 2023; R. M. Ryan and Deci 2017). According to the theory, individuals have basic psychological needs for relatedness, autonomy, and competence. Studies have

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shown that supporting these needs contributes to motivation, well-being, student engagement, and academic achievement) (Howard, Slemp, and Wang 2024; Hutomo and Kurniawati 2024).

Previous studies on Simulation-Based Learning)SBL) have addressed various SDT concepts, such as psychological needs (e.g. Walters, Potetz, and Fedesco 2017). Some have examined the impact of SBL on participants' motivation, as defined in SDT (e.g. Moll-Khosrawi, 2021). However, the subjects of these studies have primarily been medical and nursing students, rather than education students. The only exception to that was a study exploring a simulation-based programme designed to promote a need-supportive dialogue among teacher educators (Levin et al. 2025). Therefore, research on SDT-based motivational mechanisms in simulations within teacher education remains limited. The present study seeks to fill this gap by exploring the impact of a perceived needs-supportive climate in an SBL workshop on participants' autonomous motivation to participate, satisfaction of their psychological need, overall satisfaction, and skill acquisition.

Theoretical background

Simulation-based learning

Simulation is an experiential learning method that enables participants to learn about their specific professional field in a scenario that simulates reality (Levin 2021). It enables trainees to practice a variety of complex professional skills to enhance their learning without the limitations imposed by actual field work (Chernikova et al. 2020). Occurring in a safe environment, the simulation facilitates authentic experiences and encourages participants to gain knowledge by meeting challenges and making mistakes without fear of negative consequences (Kaufman and Ireland 2016; Manburg et al. 2017).

In education, most simulations are based on experimental learning theory (Kolb and Kolab 2009) or constructivist learning theories, particularly social constructivism (Vygotsky 1978), which endorse collaborative learning in a social context (Levin, Frei-Landau, and Goldberg 2023).

Simulation has been proved an effective learning tool in various domains (Chernikova et al. 2020; Linder and Weissblueth 2024), among them medical education (e.g. Hofmann, Curran, and Dickens 2021), nursing (e.g. Koukourikos et al. 2021), military (e.g. Rom and Kalderon 2013), and management (e.g. Adobor and Daneshfar 2006). The accumulated experience in these areas indicates the potential of simulations for teacher education. However, this field has begun to develop relatively late (Kaufman and Ireland 2016), implementing simulations only in the past two decades (Levin, Frei-Landau, and Goldberg 2023).

In teachers' training, simulations are part of a trend to promote clinical teaching that involves reflective and experiential learning (Levin 2021). As teachers face considerable challenges in their first steps on the job (Kaplan 2022), they must be prepared to encounter reality (Kaufman and Ireland 2016; Manburg et al. 2017). Simulation has been found to be an effective tool for that purpose and is currently integrated into several teacher education institutions in Israel (Ran and Nahari 2018). In addition, it is used for professional development of practicing teachers. Simulation

allows participants to practice a range of skills relevant to dealing with conflicts and challenges. These include decision-making, empathy, listening, questioning, receiving and giving feedback, performing reflection, and various other communication skills, which can be practiced through both individual and group sessions (Ran and Yosefsberg Ben-Yehoshoa 2021).

Different types of simulations are employed in education, including clinical simulations (Levin, Frei-Landau, and Goldberg 2023; Levin et al., 2023; Linder and Weissblueth 2024), computer-based simulations (Theelen, van den Beemt, and den Brok 2019), and immersive simulations (McGarr 2020). The current study focuses on clinical simulations, which will be presented in the following passages.

Clinical simulations utilise pre-written scenarios (Linder and Weissblueth 2024). They include interpersonal interactions with actors, who are trained to simulate conflictual encounters. The session is videotaped and then viewed by the participants. A discussion follows, involving personal and group reflection facilitated by an expert facilitator. The discussion includes an analysis of the coping strategies and skills demonstrated in the simulation (Levin 2021). The goals of these sessions is to deepen participants' reflective abilities, strengthen their intra- and inter-personal skills, which may serve them when handling complex teaching situations (Levin, Frei-Landau, and Goldberg 2023; Ran and Nahari 2018), and help them to translate theory into practice (Carrington 2009).

Clinical simulations include four stages: 1) Introduction: presenting the workshop, its objectives, and the planned activities; 2) Simulation: five minutes in which a participant engages in a pre-prepared scenario with an actor; 3) Debriefing guided by a facilitator (reviewing what happened and why, what lessons can be learned, etc.). At the end of this stage, the actor provides feedback to the participant; 4) Conclusion: participants share insights and draw conclusions (Levin, Frei-Landau, and Goldberg 2023; Levin et al., 2023).

SBL has been found to contribute in various ways to the professional development of pre-service teachers (Levin, Frei-Landau, and Goldberg 2023), as well as to the development of their professional identity (Manburg et al. 2017). The positive outcomes of simulations have been evident across the pedagogical, cognitive, behavioural, and affective domains (Vlachopoulos and Makri 2017). A key reported outcome is the acquisition of knowledge, teaching skills, and various behaviours related to participants' professional field (Chernikova et al. 2020; Theelen, van den Beemt, and den Brok 2019). This aspect enables participants to translate their theoretical knowledge into routines that can be applied on the job, thereby advancing their performance (Theelen, van den Beemt, and den Brok 2019). Simulations help educators to develop skills necessary for their educational efforts, such as classroom management skills (McGarr 2020; Theelen, van den Beemt, and den Brok 2019) and communication skills (Levin, Frei-Landau, and Goldberg 2023). From a cognitive perspective, simulations cultivate critical and creative thinking (Manburg et al. 2017). Additionally, they enhance reflective ability, which also connects to the emotional domain (Levin 2022).

In teacher education, simulations have also proved to have an effect in the social domain, by promoting social skills associated with interpersonal interactions and teamwork (Levin and Flavian 2022; Manburg et al. 2017). For example, research by Levin and Flavian (2022) found that simulation-based workshops for pre-service teachers contributed to peer-learning. Specifically, they improved participants' readiness to provide and receive feedback, and deepened collegial bonding between them. Similarly, research by

Levin et al. (2023) indicated that clinical simulations contributed to the development of collaborative learning-related insights.

An important question examined in research on SBL in teacher training concerns the emotional process and its outcomes (Levin, Frei-Landau, and Goldberg 2023). Studies have indicated that simulations contributed to social-emotional learning (e.g. Kasperski and Hemi 2022; Masri-Hirzallah 2023) and enhanced emotional self-awareness (e.g. Levin, Frei-Landau, and Goldberg 2023). Generally speaking, simulations are expected to take place in a safe environment (Kaufman and Ireland 2016; Manburg et al. 2017). Indeed, in some studies, participation in simulations produced no anxiety (e.g. Theelen, van den Beemt, and den Brok 2019). However, other studies have suggested that simulations may induce discomfort or anxiety, especially due to the presence of peer observers (e.g. Dalinger et al. 2020; Levin et al. 2025).

Self determination theory

The current research examines clinical simulation from the perspective of SDT (R. Ryan 2023; R. M. Ryan and Deci 2017). The theory proposes that every individual has three basic and universal psychological needs: relatedness, competence, and autonomy. According to the theory, satisfaction of these needs, through support from the environment, leads to optimal development, autonomous/intrinsic motivation, mental well-being, meaningful engagement, learning, social adaptation, and internalisation of behaviours and values (Howard, Slemp, and Wang 2024; R. Ryan 2023; R. M. Ryan and Deci 2017). In contrast, frustrating or thwarting these needs leads to negative outcomes.

The need for relatedness is the aspiration to have close, safe, and satisfying relationships in one's social environment and to be part of a community. The need for competence is the aspiration of individuals to experience themselves as capable of fulfilling plans and goals, which may not be easily achieved, and to feel a sense of effectiveness. The need for autonomy is the aspiration for self-direction, authentic self-expression, meaning, and freedom of choice. It involves the strive to formulate and realise values, goals, interests, and abilities perceived as autonomous and authentic, and to construct a professional identity (Reeve and Assor 2011).

The concept of motivation has a unique role in SDT. The theory emphasises the quality of motivation and therefore defines different types of motivation, classifying them according to the level of self-determination of the individual; that is, to what extent the person feels that the activity is based on and arises from an authentic inner desire (Deci and Ryan 2000). Autonomous motivation is a state in which a person experiences a sense of choice, volition, and self-determination, and is moved into action because he or she identifies with the value or behaviour (identified motivation) or because the activity itself involves deep satisfaction and curiosity (intrinsic motivation). Controlled motivation is a state in which a person is driven by coercion, pressure, hope for reward, and external commitment (extrinsic motivation) or by internal pressure, feelings of shame and guilt, and a desire for internal or external approval (introjected motivation). Behaviours resulting from extrinsic motivation can become self-determined through a process of internalisation (Deci and Ryan 2000), leading to a perception that the action is congruent with one's self-identity and relatively important compared to other actions (integrated/autonomous motivation).

According to SDT, when individuals' psychological needs are supported, they feel a sense of need satisfaction (R. M. Ryan and Deci 2017). Based on research and educational interventions grounded in SDT (Ahmadi et al. 2023; Reeve 2006; Reeve and Halusic 2009; Reeve et al. 2022), diverse methods have been developed to support each of these needs. For example, support for relatedness involves activities that encourage individuals to bond with each other, maintain a safe and reflective dialogue, and share experiences and emotions. Support for competence may result from providing supportive feedback (i.e. feedback that is positive, specific, non-judgemental, and avoids comparison to others), setting optimal challenges, and assisting in coping with difficult situations or events experienced as failure. Support for autonomy involves refraining from coercion, discussing authentic and relevant cases, enabling free expression of opinion, legitimising different perspectives, and identifying individuals' unique strengths. In an educational setting, when the teacher or facilitator supports the three needs through their behaviour, teaching methods, and relationship with students, the resulting group atmosphere can be considered a need supportive climate.

Fundamentally, SDT outlines a motivational process or mediation model (Kaplan 2022; Vansteenkiste and Ryan 2013) in which a perceived need-supportive climate enhances need satisfaction. This, in turn, fosters autonomous motivation, ultimately contributing to various outcomes, such as skill development.

SBL and motivation: a general overview

The effect of simulations on participants' motivation has been explored in domains such as medical education or health sciences and has generally been found to be positive (e.g. Laroudie 2021). Studies in this field have drawn on different theoretical perspectives, such as Bandura's (1997) concept of self-efficacy and the SDT perspective. Laroudie (2021), for example, presented a literature review on the impact of simulation training on students' motivation in health studies. The study interpreted the results through the lens of SDT and the theory of self-efficacy. In other studies, simulation-based training promoted dentistry students' self-confidence (Codeço et al. 2020), and enhanced nursing students' ability to effectively use critical thinking and decision-making processes (indicators of a sense of autonomy) (Fawaz and Hamdan-Mansour 2016).

Some studies have shown that simulation-based training has a greater impact on intrinsic motivation than on extrinsic motivation (Díaz-Agea et al. 2021). However, a study by Moll-Khosrawi et al. (2021) found that simulations did not increase medical students' autonomous motivation.

Studies from the perspective of SDT have also been conducted in other domains, such as management training (e.g. Buil, Catalán, and Martínez 2019). Buil et al. showed that need satisfaction enhanced intrinsic motivation, which in turn increased engagement and promoted the acquisition of generic skills.

Laroudie's (2021) literature review examined the climate of simulations. Several reviewed studies (e.g. Díaz-Agea et al. 2021) found that simulations fostered trust, mutual respect, and symmetrical relationships among participants. This positive climate nurtured feelings of safety and helped build positive group relationships. Participation in a safe environment was also found to evoke positive emotions and enhance learning motivation (Behrens et al. 2019).

In teacher education, various theoretical approaches to motivation have been applied. Nickl et al. (2022), for example, utilised the expectancy-value theory of Wigfield and Eccles (2000), exploring pre-service teachers' motivational dispositions such as individual interest, self-efficacy, and perceived self-regulation abilities. Studies have also found that simulations promoted self-efficacy (e.g. Bautista and Boone 2015; Manburg et al. 2017; Theelen, van den Beemt, and den Brok 2019). Frei-Landau and Levin (2023) explored the needs of the instructors in an SBL workshop drawing on the framework of Maslow's Hierarchy of Needs. However, apart from Levin et al. (2025), no studies have employed an SDT perspective to investigate the impact of SBL in teacher education, particularly regarding how a perceived need-supportive climate influences motivational variables.

SDT and clinical SBL

SDT was chosen as the theoretical framework for this research due to its shared assumptions with SBL (Levin et al. 2025), particularly regarding the necessary conditions for learning, with an emphasis on need support (R. M. Ryan and Deci 2017). The needs of SBL participants can be supported in various ways, such as by providing a choice in how to participate in the simulation (autonomy support), creating a safe environment and encouraging closeness among participants (relatedness support), and facilitating skill practice and offering effective feedback (competence support).

SBL focuses on learning, while SDT explains the motivational processes and conditions necessary for individuals to develop, thrive, function optimally, and learn (R. M. Ryan and Deci 2017; Soe et al. 2025). Prior studies have shown that teachers' emotional and social skills are best developed in environments that support their needs (Assor and Yitshaki 2023). Experiencing such an environment within SBL may serve as a platform for acquiring a variety of inter- and intra-communication skills (Kaplan et al. 2023), which are key for achieving the desired outcomes of SBL. Therefore, SDT may inform the design of simulations such that they promote autonomous motivation and facilitate meaningful learning of knowledge and skills.

Despite the shared foundational assumptions, we found no studies linking SBL and SDT in the context of pre-service, induction-year, or in-service teachers. The only relevant SDT-based study, by Levin et al. (2025), examined a different context. No research has yet explored how perceived need support during SBL impacts participants' sense of need satisfaction and autonomous motivation, which may, in turn, lead to positive outcomes such as skill acquisition. Thus, understanding teacher learning through this dual prism remains unexplored. The present study aims to address this gap.

The present study

To date, the fields of SDT and SBL have been researched separately within the framework of teacher education; both of their contributions have been found positive (e.g. Kaplan and Madjar 2017; Yablon, Iluz, and Eizenhamer 2022). The present study integrates these two fields of research, seeking to understand the SDT-based motivational mechanisms involved in SBL, specifically the SDT mediation model.

RQ: What are the motivational processes that promote simulation satisfaction and skills acquisition in simulations? Specifically, how does a need-supportive climate affect experiences of need satisfaction, autonomous motivation, simulation satisfaction and skills acquisition?

The study examines the following variables: perceived need-supportive climate (independent variable); need satisfaction and autonomous motivation (mediating variables); and skills acquisition and simulation satisfaction (outcome variables).

Research hypotheses

(1) Perceived need-supportive climate will positively affect participants' sense of need satisfaction, which in turn will enhance their autonomous motivation to participate in the simulation.
(2) Autonomous motivation to participate in the simulation will positively affect both skills acquisition and simulation satisfaction.
(3) Participants' need satisfaction and autonomous motivation will mediate the relationship between perceived need-supportive climate and the outcome variables: skills acquisition and simulation satisfaction.

Method

Research population

The study included 307 Jewish and Arab participants (85.7% women). The sample consisted of all participants in a clinical simulation workshop. Participants were first- to third-year education students, teaching interns, new teachers in their post-internship year, and a few in-service teachers. The diversity of the sample reflects the assumption that the motivational processes under study are universal.

The clinical simulation workshop took place at the Simulation Center of Kaye Academic College of Education. During each session, participants engaged in two scenarios in groups of up to 18 participants.

Research tools

Participants responded to validated questionnaires, which had been previously used in motivational studies with similar populations: pre-service teachers (Kaplan and Madjar 2017), interns, new teachers (Kaplan 2022), and practicing teachers (Roth et al. 2007). The questionnaires were further validated through confirmatory factor analysis and reliability tests, all of which yielded satisfactory results (ranging from 0.75 to 0.92). Below is a description of the research tools.

Perceived need-supportive climate (PC)

Perceived need-supportive Climate was measured based on The Learning Climate Questionnaire-LCQ (e.g. Black and Deci 2000), which was adapted to the current setting.

Table 1. Confirmatory factor analysis for the variable perceived climate (PC).

P	t	S.E.	B	β		
< .001	12.07	.06	.86	.698	1	Perceived Climate
< .001	12.443	.076	.942	.751	2	Perceived Climate
< .001	12.554	.075	.946	.758	3	Perceived Climate
< .001	13.731	.078	1.069	.833	4	Perceived Climate
< .001	13.385	.069	.928	.811	5	Perceived Climate
< .001	12.828	.078	1.001	.775	6	Perceived Climate
< .001	12.569	.080	1.011	.759	7	Perceived Climate
< .001	13.457	.079	1.067	.815	8	Perceived Climate
< .001	13.418	.079	1.057	.813	9	Perceived Climate

The participants were asked to relate to their experiences during the simulation. The questionnaire consisted of nine items. Three items related to autonomy support (e.g. 'It was important to the facilitator that the simulation deal with topics of interest to the participants'.) Two items related to competence support (e.g. 'The facilitator answered participants' questions fully and clearly',) and four items related to relatedness support (e.g. 'During the simulation, trust was established with the facilitator'). The responses to the questionnaires ranged on a scale from 'Strongly agree' (5) to 'Strongly disagree' (1). Scores were calculated by averaging the individual item scores. The reliability was .93.

To assess the validity of the questionnaire's structure, Confirmatory Factor Analysis was conducted, indicating that the single-factor model with nine items was adequate for the data ($\chi 2(27) = 109.79$, $p < .001$, CFI = .96, RMSEA = .09). All nine items loaded satisfactorily on the factor, as described in Table 1. To create the variable, all items were averaged (except item 13, removed due to unreasonable reliability) ($\alpha = .93$).

Autonomous motivation

The Autonomous Motivation scale was originally developed and validated by Ryan and Connell (1989). It has been employed in various fields, including education (Black and Deci 2000; Roth et al. 2007) and was adapted to the current setting. The 9-item questionnaire included identified and intrinsic items (e.g. 'I actively participated in the simulation because I found the topics we focused on interesting'/'Because in the simulation I learned important things for my future work as a teacher'). The responses ranged on a scale of 1–5 from 'Strongly agree' (5) to 'Strongly disagree' (1). The reliability was .89.

Need satisfaction and need frustration

Satisfaction and frustration of basic psychological needs were measured using Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS), which is based on a manual developed by van der kaap-Deeder et al. (2020). The scale assesses the degree of perceived satisfaction and frustration of the three needs. Originally developed by Chen, Vansteenkiste et al. and demonstrating good reliability and construct validity (Chen et al. 2015), the scale was adapted to the current setting. It included a balanced combination of 24 satisfaction and frustration items, divided into six categories with four items in each category: satisfaction of the need for autonomy (e.g. 'During the simulation, I felt free to bring myself as I really am'), satisfaction of the need for relatedness (e.g. 'I felt close and connected to the people in the group'), satisfaction of the need for competence (e.g. 'I felt

capable during the simulation'), frustration of autonomy (e.g. 'I experienced my participation in the simulation as something I "must" do'), frustration of relatedness (e.g. 'I felt that the people I was with in the simulation didn't like me'), and frustration of competence (e.g. 'I felt insecure about my abilities during the simulation'). The responses to the questionnaires ranged on a scale of 1–5 from 'Strongly agree' (5) to 'Strongly disagree' (1).

The reliabilities were as follows: autonomy satisfaction .67, relatedness satisfaction .75, competence satisfaction .80, autonomy frustration .77, relatedness frustration .92, and competence frustration .82. The variables for satisfaction of relatedness, competence, and autonomy were averaged into one variable – a sense of need-satisfaction ($\alpha = .90$). Similarly, the variables of need-frustration were also averaged into a single variable ($\alpha = .95$).

Simulation satisfaction

To measure participants' satisfaction with the simulation, we used a scale based on a previous study (Kaplan 2021) and adapted it to the current setting. The scale included six items expressing the degree of participants' satisfaction with various aspects of the simulation training. Sample items: 'I am satisfied with the activities I experienced in the simulation', 'I am satisfied with the content taught in the simulation'. The reliability was .88.

Skills acquisition

The scale for assessing participants' acquisition of skills was developed for the current study. It included 13 items, focusing on three areas of skills. The first area was classroom skills, including the advantages and disadvantages associated with certain teaching methods; problem-solving skills; and decision making in teaching (4 items, e.g. 'The simulation made me think about the prices and gains associated with using different methods to handle classroom problems'). The second category encompassed interpersonal skills such as empathy, listening, coping with conflict, and asking questions (5 items, e.g. 'The simulation clarified the importance of accepting others and the ability to empathise'). The third category related to self-learning, touching on issues such as inner strengths and resources, self-awareness, and recognising self-perceptions (4 items, e.g. 'The simulation enabled me to understand and identify my perceptions on teaching').

To assess the validity of the questionnaire structure, a confirmatory factor analysis was conducted. It was found that the 13 items load on a single factor. In this validation process, four items were removed from the analysis due to low loadings (59, 60, 75, 70). The confirmatory factor analysis indicated that the single-factor model with the 13 items fits the data well ($\chi 2(65) = 238.61$, $p < .001$, CFI = .95, RMSEA = .09), and the 13 items load adequately on the factor, as described in Table 2. Consequently, these 13 items were averaged as a single variable ($\alpha = .96$).

Procedure

At the end of the simulation, participants received an explanation about the research, the voluntary basis of their participation, and confidentiality assurance. This information was

Table 2. Confirmatory factor analysis for the variable of skills acquisition.

P	t	S.E.	B	β		
< .001	12.98	.06	1.05	.783	1	Skills acquisition 1
< .001	17.184	.064	1.100	.857	2	Skills acquisition 2
< .001	17.425	.066	1.148	.866	3	Skills acquisition 3
< .001	13.845	.062	.863	.725	4	Skills acquisition 4
< .001	14.610	.068	.988	.757	5	Skills acquisition 5
< .001	15.904	.070	1.105	.809	6	Skills acquisition 6
< .001	17.130	.069	1.189	.855	7	Skills acquisition 7
< .001	13.559	.071	.959	.713	8	Skills acquisition 8
< .001	16.995	.067	1.134	.850	9	Skills acquisition 9
< .001	16.060	.072	1.154	.815	10	Skills acquisition10
< .001	17.182	.072	1.230	.857	11	Skills acquisition11
< .001	15.742	.066	1.036	.802	12	Skills acquisition12
< .001	15.648	.077	1.211	.85	13	Skills acquisition13

also included in the questionnaire, where participants signed their consent for participation. The research was approved by the academic institution's ethics committee. The questionnaire was administered online immediately after the simulation.

Measurement model

A confirmatory factor analysis was conducted to examine the measurement model of the research indicators. The model included six factors: perceived need-supportive climate, need satisfaction, need frustration, autonomous motivation, simulation satisfaction, and skills acquisition. To maintain the ratio between the number of variables and sample size (following the 10:1 rule), all items within each factor were randomly clustered into parcels, or groups of items. Each factor comprised about three parcels, each containing four items.

The analysis revealed that the fit indices of the six-factor model were reasonably good for the data ($\chi 2(65) = 238.61$, $p < .001$, CFI = .95, RMSEA = .09). All parcels adequately loaded on the relevant factors (see Table 3). The associations between the research indicators were significant, except for those between need frustration and need satisfaction, autonomous motivation, simulation satisfaction, and skills acquisition, which were found to be insignificant (see Table 3).

Data analysis

First, we examined the structural validity of the research variables using Confirmatory Factor Analyses (CFA) in AMOS 25. Model fit was assessed using multiple fit indices, including Chi-square (χ^2), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA). Acceptable model fit was determined based on conventional cut-off criteria (CFI & TLI > 0.90, RMSEA < 0.08, SRMR < 0.08). Next, we assessed the correlations between the research variables using Pearson's correlation analysis.

To test our research hypotheses regarding the mediation model, we conducted path analysis using maximum likelihood estimation in AMOS 25. Model adequacy was evaluated using the same fit indices as in CFA. Indirect effects were examined through Bootstrapping analysis (5,000 resamples) with bias-corrected 95% confidence intervals (CIs). The statistical significance of indirect effects was determined if the confidence interval did not include zero.

Table 3. Confirmatory factor analysis of all the factors in the study.

P	t	S.E.	B	β		
< .001	21.09	.05	.978	.856	Parcel 1	Perceived Climate
< .001	22.351	.052	1.171	.940	Parcel 2	Perceived Climate
< .001	20.009	.058	1.168	.871	Parcel 3	Perceived Climate
< .001	19.06	.05	1.09	.860	Autonomy satisfaction	Need Satisfaction
< .001	19.294	.058	1.122	.870	Relatedness satisfaction	Need Satisfaction
< .001	19.052	.058	1.101	.862	Competence satisfaction	Need Satisfaction
< .001	22.03	.05	.97	.857	Autonomy frustration	Need Frustration
< .001	24.177	.050	1.210	.945	Relatedness frustration	Need Frustration
< .001	24.768	.045	1.126	.961	Competence frustration	Need Frustration
< .001	21.35	.05	1.09	.895	Parcel 1	Autonomous Motivation
< .001	19.984	.041	.825	.848	Parcel 2	Autonomous Motivation
< .001	20.117	.039	.794	.851	Parcel 3	Autonomous Motivation
< .001	36.01	.03	1.21	.964	Parcel 1	Skills acquisition
< .001	34.904	.029	1.022	.933	Parcel 2	Skills acquisition
< .001	34.294	.032	1.093	.929	Parcel 3	Skills acquisition
< .001	18.23	.05	.76	.838	Parcel 1	Simulation satisfaction
< .001	20.107	.049	.978	.928	Parcel 2	Simulation satisfaction

Findings

Preliminary analysis

First, descriptive statistics were applied to all the research indices and the relationships between them were analysed using Pearson correlations (see Table 4). As shown in the table, participants' perceived need-supportive climate was found to be significantly and positively correlated with need satisfaction, autonomous motivation, skills acquisition, and simulation satisfaction; and negatively correlated with need frustration. In other words, when participants perceived the climate as more positive, they reported higher need satisfaction, autonomous motivation, skills acquisition, and simulation satisfaction, and lower need frustration. The table further reveals a clear and positive correlation between need satisfaction and autonomous motivation, skills acquisition, and simulation satisfaction. In other words, high levels of need-satisfaction were associated with high levels of autonomous motivation, skills acquisition, and simulation satisfaction.

Table 4. Descriptive statistics and correlations between research measurements.

	Mean)S.D)	1	2	3	4	5	6
(1) Perceived Climate	4.75 (.45)	1					
(1) Need Frustration	2.79 (1.33)	−.123*	1				
(1) Need Satisfaction	4.49 (.56)	.554**	.031	1			
(1) Autonomous Motivation	4.51 (.58)	.633**	.075	.687**	1		
(1) Skills acquisition	4.45 (.65)	.516**	.034	.646**	.665**	1	
(1) Simulation satisfaction	4.45 (.59)	.613**	−.109	.654**	.704**	.740**	1

Main analysis: testing the research hypotheses

To examine the mediation hypothesis, namely that positive perceptions of the simulation climate will predict high levels of need satisfaction and autonomous motivation, which in turn will predict high levels of skills acquisition and simulation satisfaction, a Structural Equation Modeling (SEM) analysis was conducted using AMOS 25 (Arbuckle 2017). Since the preliminary analyses found that need frustration was not significantly correlated with any of the research indices, this variable was removed from the hypothesised mediation model. Accordingly, the model included perceived need-supportive climate as an exogenous, or independent variable, need satisfaction and autonomous motivation as mediating variables, and skills acquisition and simulation satisfaction as dependent variables. The model is depicted in Figure 1, and the analysis findings are presented in Table 5.

The analysis indicated that the goodness-of-fit indices were reasonable and that the model fit the data ($\chi 2(217) = 564.19$, $p < .001$, CFI = .94, RMSEA = .07). Furthermore, as hypothesised (Hypotheses 1 and 2), the analysis showed that perceived need-supportive climate was positively and significantly associated with need satisfaction, which was positively and significantly related to participants' autonomous motivation. This, in turn, positively and significantly predicted simulation satisfaction and skills acquisition. Thus, students who perceived the simulation climate more positively reported

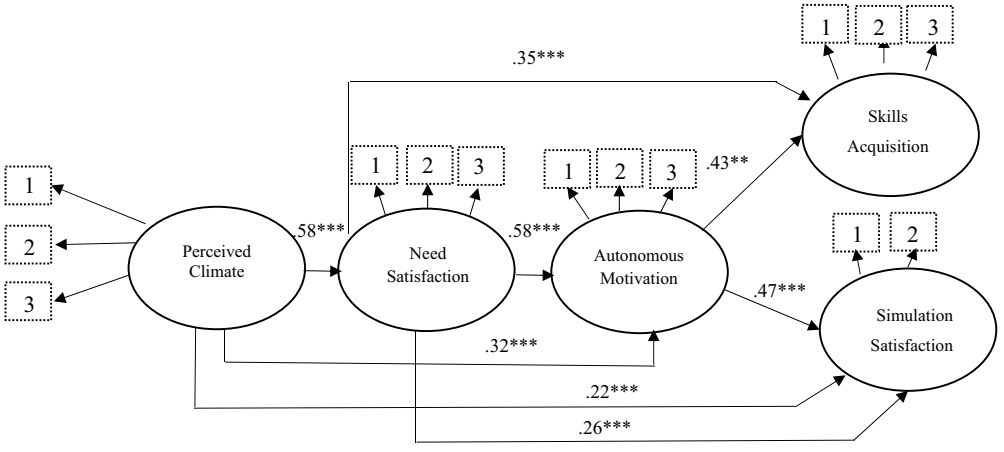

Figure 1. Results of the predicted mediation model.

Table 5. Results of the measurement and structural model of the predicted mediationmodel.

P	t	S.E.	B	β		
< .001	9.792	.082	.800	.580	Need Satisfaction	Perceived Climate
< .001	9.790	.076	.743	.581	Autonomous Motivation	Need Satisfaction
< .001	5.876	.097	.572	.324	Autonomous Motivation	Perceived Climate
< .001	4.682	.093	.434	.351	Skills Acquisition	Need Satisfaction
< .001	3.620	.084	.305	.265	Simulation Satisfaction	Need Satisfaction
< .001	5.258	.080	.420	.435	Skills Acquisition	Autonomous Motivation
.362	.912	.099	.090	.053	Skills Acquisition	Perceived Climate
< .001	3.788	.091	.344	.216	Simulation Satisfaction	Perceived Climate
< .001	5.677	.074	.421	.467	Simulation Satisfaction	Autonomous Motivation

Table 6. The indirect relationships between LC and autonomous motivation, skills acquisition, and satisfaction with the simulation.

P	Confidence interval (CI) – upper bond	Confidence interval (CI) – lower bond	Standardized indirect effect	
< .001	.50	.22	.34	Perceived Climate – Need Satisfaction – Autonomous Motivation
< .001	.61	.33	.46	Perceived Climate – Need Satisfaction – Autonomous Motivation – Simulation Satisfaction
< .001	.66	.35	.49	Perceived Climate – Need Satisfaction – Autonomous Motivation – Skills Acquisition

higher need satisfaction, which in turn predicted higher autonomous motivation, which in turn predicted higher levels of skills acquisition and simulation satisfaction.

Additionally, direct positive and significant relationships were found between need satisfaction and both skills acquisition and simulation satisfaction, as well as between need-supportive climate and both autonomous motivation and simulation satisfaction.

An examination of indirect effects revealed that the indirect path between need-supportive climate and skills acquisition, and simulation satisfaction, through need satisfaction and autonomous motivation, was significant. Therefore, confirming our third research hypothesis, need satisfaction and autonomous motivation partially and significantly mediated the relationship between need-supportive climate and both skills acquisition and simulation satisfaction. The indirect effects and their significance are further elaborated in Table 6.

Discussion

The research highlights the importance of creating a supportive psychological climate in simulation training. Participants who experienced the simulation climate as supportive of their needs reported significantly more positive feelings of need satisfaction, autonomous motivation, overall satisfaction with the simulation, skills acquisition, and lesser feelings of need frustration.

The findings echo previous research results, which have shown that need support promoted feelings of need satisfaction and autonomous motivation, which in turn led to a range of positive outcomes, across diverse populations including school students (Kaplan et al. 2014), experienced teachers (Aelterman et al. 2016), pre-service teachers (Kaplan and Madjar 2017), and beginning teachers (Kaplan 2021, 2022). In the current study, participants' feelings of need satisfaction and their autonomous motivation to participate in the training contributed to a sense of satisfaction with the simulation as well as to skills acquisition related to teaching, interpersonal interactions, and self-awareness.

Previous research has pointed to the importance of a safe simulation environment as a condition for learning (Kaufman and Ireland 2016; Manburg et al. 2017). The current study adds to this knowledge by describing the nature of such an environment. For participants to feel safe to explore, make mistakes, and learn, they need to experience support for their psychological needs. While various ways to support psychological needs

have been identified in the literature (e.g. Ahmadi et al. 2023; Reeve et al. 2022), the tools to provide such support should be tailored to the specific context of SBL. Autonomy-supportive dialogue (Kaplan and Assor 2012), for example, involves understanding participants' perspectives (such as their reasons for suggesting certain actions to resolve a conflict), providing rationale when suggesting a particular course of action, offering choice such that participants can decide on their own path, and brainstorming solutions without imposing any specific way. Support for relatedness can manifest in encouraging participants to use emotional language and expressing empathy when they struggle. Further, support for competence can be achieved through conceptualisation and discourse about the skills acquired in the simulation, specific feedback provided by the actor, or conveying to participants that they are capable of meeting the challenges by implementing methods taught in the simulation.

The findings expose the motivational mechanisms active during the simulation. When participants perceived the climate more positively, they reported higher levels of need-satisfaction and autonomous motivation, which in turn predicted higher levels of skills acquisition and simulation satisfaction. Need satisfaction and autonomous motivation were found to partially and significantly mediate the relationship between climate perception and simulation outcomes. Therefore, for the simulation to lead to meaningful learning, it is crucial that facilitators and actors (in a clinical simulation) promote satisfaction of needs, which will advance autonomous motivation. However, direct relationships were found between climate perception and both simulation satisfaction and autonomous motivation, and also between need satisfaction and both skills acquisition and simulation satisfaction. The existence of direct effects illuminates the power of the simulation atmosphere as a condition for fostering meaningful learning.

An additional contribution of the study is its corroboration of the mediation model of SDT proposed by Vansteenkiste and Ryan (2013), which describes the motivational mechanisms underlying the interaction between individuals and their environment. According to Vansteenkiste and Ryan's model, environmental support contributes to experiences of need-satisfaction, which in turn lead to various positive expressions of well-being, such as the sense of satisfaction and skills acquisition found in the current study. The model in our study also relates to autonomous motivation, which flourishes in situations of need support (R. Ryan 2023).

The findings indicate that the simulation promoted participants' acquisition of skills, including social-emotional skills (such as empathy towards others or self-awareness). Skills acquisition is considered one of the desired goals of SBL (Chernikova et al. 2020; Theelen, van den Beemt, and den Brok 2019). In this case, the skills were acquired in an environment that simulated reality and supported participants' needs, which is necessary for meaningful learning (R. M. Ryan and Deci 2017), and not just acquired technically. Extensive research in education and psychology shows that optimal socio-emotional development is primarily based on growth experiences stemming from support and satisfaction of psychological needs and accompanying internalisation (Assor and Yitshaki 2023; R. Ryan 2023). Assor and Yitshaki maintain that social-emotional learning requires more than acquisition of skills. Our study supports this claim, indicating that a need-supportive environment is a significant factor in promoting acquisition of skills in a simulation.

According to SDT, experiences of need satisfaction accumulate over time, becoming internal resources for growth and resilience that support the individual on emotional,

social, and motivational levels (Vansteenkiste and Ryan 2013). In the context of simulations, feelings of need satisfaction, autonomous motivation, and satisfaction with the simulation have the power to transform the training, even when it is a single event, into a memorable experience and a resource of strength. This resource may then guide the trainees when they cope with similar situations in their forthcoming educational work. Overall, the accumulated experiences from the simulation are likely to foster efficient social, emotional, cognitive, and behavioural functioning in the future, based on feelings of satisfaction, meaningfulness, and well-being (R. M. Ryan and Deci 2017), which are promoted in the simulation.

The study demonstrates how theory can be connected to practice and highlights the importance of studying the routines employed in simulations. Thus, the merit of grounding simulations in theoretical and empirical knowledge stems from the findings, as we seek to deepen our understanding of the motivational processes experienced by participants and find ways to enhance them.

Research limitations and future directions

The first limitation concerns the study population. Participants came from varying career stages (pre-service, in-service, new, and veteran teachers). However, these groups may differ in their experiences, perceptions, and professional challenges, which could affect the results. Future research should investigate these distinct populations separately to gain a deeper understanding of their unique perspectives. Additionally, cultural differences between participant groups, such as Jewish and Arab teachers, may influence the study's outcomes. Exploring these cultural dimensions in future studies could provide valuable insights into how contextual and sociocultural factors shape teachers' experiences and professional development in SBL.

A second limitation is the quantitative nature of the research paradigm. Future research could benefit from employing qualitative methods, such as interviews, to attain further knowledge about participants' experiences and the outcomes of the workshops. This approach would allow for a more detailed exploration of the subjective aspects that may not be fully captured by quantitative data.

The third limitation relates to the specific type of simulation examined in the research – clinical simulation. Other types of simulation should also be explored to better understand both the theoretical and practical aspects of SDT as a leading approach in the field of simulations. In this regard, it would be valuable to analyse additional aspects of the simulation process, such as the role of the actor or facilitator in creating a supportive environment that addresses participants' needs.

Another limitation lies in the cross-sectional design of the study. It was conducted at a single point in time, following just one simulation. Additional insights could be gained through a longitudinal study, where participants engage in multiple simulations over time. Such a study could shed light on how a series of simulations impacts the internalisation of various learning outcomes, an effect that cannot be inferred from a single event.

To sum up

Studies in the field of SBL have indicated the positive outcomes of the simulation process (Vlachopoulos and Makri 2017) and its contribution to participants' professional development (e.g. Manburg et al. 2017; Theelen, van den Beemt, and den Brok 2019), as well as their motivation (Laroudie 2021). The current study adopts the SDT framework and provides a new perspective on SBL processes.

The findings of the study highlight the critical role of a supportive psychological climate in simulations, which promotes need satisfaction and autonomous motivation, ultimately leading to positive learning outcomes. Through the lens of SDT, the study provides new insights into the motivational mechanisms that foster participants' engagement and meaningful learning in SBL, specifically underscoring the mediating role of need satisfaction and autonomous motivation. This understanding of motivational processes can inform the design of SBL such that the simulations optimally lead to meaningful learning. The study contributes to the theoretical and practical knowledge regarding the implementation of SBL and may inspire facilitators or actors to consider specific strategies for fostering a need-supportive environment. As this is a pioneering study, further research is needed to ground SDT as a leading approach in the field of SBL.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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