

NATIONWIDE DIGITAL SIMULATION FOR HEALTH PROFESSIONS ADMISSION TEST PREPARATION: DEVELOPMENT, IMPLEMENTATION, AND EARLY DESCRIPTIVE DATA FROM ITALIAN STUDENTS

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ABSTRACT

Admission to undergraduate programs in the Health Professions represents a high-stakes process that requires structured and reliable assessment tools to ensure fair and transparent selection. In this context, digital simulation environments may offer valuable support for test preparation while also enabling the collection of large-scale data on student participation and performance. The present study describes the development and implementation of a digital application designed to simulate the Italian admission test for Health Professions degree programs. The platform was used to deliver a nationwide initiative, The Simulation Day 2025, which included both an asynchronous simulation available over several days and a live simulation conducted shortly before the official examination. Both formats reproduced the structure, timing, and scoring criteria of the ministerial test. Early descriptive data were collected from students who voluntarily accessed the platform. Analyses focused on participation patterns, completion times, overall scores, and performance across subject areas. In addition, data from training activities were examined to explore changes in response accuracy with repeated exposure to test questions. The results show broad participation across different educational backgrounds and geographic areas, together with variability in performance and engagement patterns. Overall, the findings suggest that digital simulation tools are a feasible and scalable approach to support admission test preparation and to generate useful data for understanding student performance in high-stakes assessment contexts.

KEYWORDS

Admission Test, Simulation, Health Education, Digital Assessment, Simulation-Based Learning, Digital Application

1. INTRODUCTION

Admission to undergraduate programs in the Health Professions represents a high-stakes process, as the number of applicants consistently exceeds the number of available training positions. Health professions education is resource-intensive, associated with low attrition rates, and leads to roles with significant responsibility for individual and public health (Prideaux et al., 2011). Consequently, decisions made at the point of entry have long-term implications not only for individual candidates, but also for educational institutions and healthcare systems. For these reasons, selection cannot be considered a purely administrative procedure, but rather a form of assessment for selection, requiring the same standards of quality, validity, reliability, and transparency applied to in-course and licensing assessments (Salvatori, 2001) (Duncan-Hewitt, 1996). Admission tests have therefore been developed as standardized tools to manage large applicant pools, ensure comparability between candidates, and support defensible decision-making processes.

Pre-admission academic indicators are widely used to support admission decisions in health professions education; however, less attention has been paid to their relationship with students' subsequent need for academic support services. Evidence suggests that, even within academically competitive cohorts, some students require substantial tutoring, highlighting the limits of traditional admission metrics as sole indicators of academic preparedness. In particular, lower quantitative GRE scores combined with a lighter pre-admission academic course load have been shown to be associated with a greater need for post-admission academic assistance (Oliveras-Urueta & Williamson, 2013).

Within this context, the availability of preparation tools that accurately reproduce the structure, timing, and scoring rules of admission tests becomes particularly relevant. Digital simulation instruments allow candidates to experience test conditions that closely mirror the official examination, while simultaneously enabling standardized administration and large-scale data collection. Such tools serve a dual purpose: supporting students' preparation for a high-stakes assessment and providing early empirical insights into performance patterns within the applicant population (Gierl et al., 2012).

Digital simulation tools offer the opportunity to provide large-scale, structured, and accessible training experiences while ensuring consistency in administration and scoring (Almagooshi, 2015). When aligned with official regulations, such tools can reproduce real examination conditions and simultaneously allow for the systematic collection of performance data. The dual role (formative for students and informative for educators) makes digital applications particularly valuable in the context of admission test preparation for Health Professions programs.

Despite the widespread use of admission tests for Health Professions programs, the availability of structured, standardized digital tools specifically designed to prepare candidates for these examinations remains limited. While several commercial platforms offer practice questions and mock tests, these tools are rarely described or evaluated within the peer-reviewed literature. To date, there is a lack of published studies assessing the development, implementation, and early outcomes of digital simulation applications specifically aimed at supporting preparation for Health Professions admission tests. This gap highlights the need for rigorously designed simulation tools that not only reproduce official test conditions but also generate empirical data to inform both educational practice and future research (Patterson et al., 2016).

Simulation-based approaches have been widely adopted in health professions education as effective strategies to support learning, assessment, and preparedness for high-stakes evaluations (Ghoman et al., 2021). Literature demonstrates that simulated tests and scenarios enhance familiarity with assessment formats, reduce test-related anxiety, and promote active engagement with cognitive demands under time constraints (Brentnall et al., 2022; Coyne et al., 2021; Mitchell & Ivimey-Cook, 2023). Digital and technology-supported simulations, when integrated with traditional learning methods, provide structured, interactive learning environments and enable repeated practice with feedback, which are key elements for adult learning. These characteristics support the use of digital simulation tools not only in clinical training, but also as preparatory instruments for high-stakes evaluative contexts, such as admission tests, where familiarity with format, timing, and cognitive demands is essential (*MAIN ADVANTAGES OF THE SIMULATION-BASED MEDICAL EDUCATION*, s.d.).

Within this framework, the 2025 edition of The Simulation Day, organized by The Faculty and promoted by the POT TOP Network (Piano Orientamento e Tutorato delle Professioni Sanitarie 2023-2025), was developed as a nationwide simulation initiative supporting students preparing for the admission test to Italian Health Professions degree programs (Ministero dell'Università e della Ricerca, s.d.; *Piano per l'Orientamento e il Tutorato (POT) – Progetto TOP | Dipartimento di Medicina Clinica e Sperimentale*, s.d.). The initiative was delivered through a dedicated digital application designed to replicate the structure and evaluation criteria of the official ministerial examination.

The initiative consisted of two complementary simulation formats. An asynchronous event-based simulation was made available over a four-day period, followed by a live simulation, shortly before the official admission test. Both simulations adhered strictly to the ministerial structure, with scoring calculated according to the criteria established by the relevant decree.

The aim of the present article is to describe the development of the digital application, focusing on its design and implementation as a tool for admission test simulation in the Health Professions. Then, it reports early descriptive data from Italian students who participated in the 2025 simulations, offering a preliminary overview of performance outcomes and competence areas assessed. Together, these elements provide an initial contribution to the evaluation of digital simulation tools in the preparation for Health Professions admission tests.

2. MATERIALS AND METHODS

The study was conducted by a research group “Rabilitazione, Evidenze e Sviluppo” (R.E.S.) from “Sapienza” University of Rome (Berardi et al., 2023; Petracca et al., 2024; Sellitto et al., 2024).

2.1 Population

The study population consisted of students preparing for the Italian admission test to undergraduate Health Professions degree programs who voluntarily participated in “The Simulation Day 2025” through the Thefaculty digital application. Participants were recruited nationwide via institutional communication promoted by the POT TOP Network and through dissemination activities conducted by participating universities, which actively informed

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prospective candidates about the simulation initiative. Access to the simulations was open and free of charge, allowing broad participation regardless of geographic location or educational background.

Eligible participants included individuals intending to apply for Health Professions programs who completed at least one full simulation within the digital platform. Participants were distributed across two distinct simulation formats, including an asynchronous event-based simulation and a live simulation conducted shortly before the official admission test. This distinction allowed the inclusion of participants exposed to different temporal and contextual testing conditions within the same digital environment. Both upper secondary school students (or recent graduates) and university students or graduates were included, reflecting the heterogeneous population typically involved in admission test preparation. Participants were required to complete the simulation under standardized conditions, including predefined time limits and scoring rules aligned with the official ministerial examination. All simulations were completed remotely in an unsupervised setting, reflecting real-world conditions of voluntary engagement with digital preparation tools.

No exclusion criteria were applied based on age, gender, educational background, or geographic origin, as the primary aim was to capture a realistic and inclusive representation of candidates preparing for the national admission test. This open recruitment strategy was consistent with the educational and formative purpose of the initiative and allowed the collection of early descriptive data on a broad applicant population under simulated high-stakes testing conditions.

2.2 Development of the Digital Simulation Application

The digital application was developed to support large-scale simulation of the Italian admission test for Health Professions, with the aim of reproducing the official ministerial examination conditions as closely as possible. The platform hosted The Simulation Day 2025, an initiative organized by The Faculty and promoted by the POT TOP Network (Piano Orientamento e Tutorato delle Professioni Sanitarie 2023-2025). The application enabled the administration of two nationwide simulation formats: an asynchronous event-based simulation available over four consecutive days (July 31 to August 3, 2025) and a live simulation conducted on September 5, 2025, shortly before the official admission test.

The simulation covered the subject areas defined by the official Italian admission test for Health Professions, including basic skills and knowledge, logic, biology, chemistry, and mathematics and physics.

Both simulations were delivered through the same digital environment and were designed to mirror the ministerial test structure, consisting of 60 multiple-choice questions to be completed within a maximum time of 100 minutes. Scoring was calculated according to the criteria established by the official decree governing admission to Health Professions degree programs. The application allowed students to access the simulation remotely, complete the test under standardized timing constraints, and receive an automatically computed score. The platform ensured uniform administration across users by enforcing identical timing constraints and automated scoring procedures for all participants.

In addition to test administration, the application collected user-generated data related to participation, completion time, scores, and performance across predefined subject areas. These data were stored in an aggregated and anonymized format, allowing large-scale analysis of user

behavior and performance without identifying individual participants. The platform also included training functionalities that enabled repeated exposure to test questions during the preparation period, allowing the collection of aggregated response data over time. During the preparation period, the platform recorded a large volume of training interactions, generating a substantial dataset of responses that captured performance across repeated exposures to the same questions over time. Data generated by the simulations and by the in-app training activities were subsequently analyzed to describe participation patterns, performance outcomes, and competence areas. This dual data source enabled the examination of both performance under simulated test conditions and learning dynamics during repeated practice sessions. Part of the descriptive analysis was supported by the Data Assistant, an AI-based data analysis tool developed by the faculty and used in a beta version to facilitate dataset exploration and interpretation.

2.3 Data Analysis

Data analysis was conducted using aggregated data generated by the digital platform during both simulation events and the in-app training activities. For each simulation, descriptive analyses were performed on participation patterns, completion times, overall scores, and performance across predefined subject areas, in accordance with the official structure of the admission test. When participants completed the same simulation more than once, only the first attempt was retained for analysis to avoid duplication and ensure independence of observations. Comparative analyses were carried out between the two simulation formats to explore changes in overall performance and subject-specific scores, as well as within-subject comparisons for participants who took part in both simulations. In addition, subject-specific analyses were conducted to explore differences in performance across the predefined knowledge domains included in the admission test structure. In addition, data from the training functionalities of the application were analyzed over the preparation period to examine response accuracy by subject area and to evaluate performance trends as a function of repeated exposure to the same questions (occurrence-based analysis). In this context, “occurrence” was defined as the number of times a specific question was presented to the same user, allowing the assessment of changes in response accuracy across successive exposures. All analyses were descriptive in nature and aimed at characterizing early performance patterns and learning dynamics within the user population. Descriptive statistics included the calculation of mean values, distribution patterns, and percentages of correct responses across subject areas and simulation formats. Part of the exploratory data processing and visualization was supported by the Data Assistant, an AI-based data analysis tool developed by The faculty and used in a beta version to facilitate dataset exploration and interpretation.

3. RESULTS

3.1 Sample Characteristics

As reported in Table 1, the two simulation formats involved participants with comparable demographic and educational characteristics. In both simulations, the study population included

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students from upper secondary schools or recent graduates, as well as university students and graduates. Mean age was similar across the two simulation events. User segmentation data indicated the presence of both pre-university and post-secondary participants in each simulation. Information on secondary school background was available for a substantial proportion of participants in both simulations and included a range of educational tracks. Geographic data showed participation from all Italian regions in both simulation formats. More detailed analyses of participants' preferences indicated a wide distribution of selected universities and degree programs, reflecting a heterogeneous orientation toward Health Professions education across the national territory.

Table 1. Demographic and educational characteristics of the sample

Characteristic	Simulation 1 (Event-based)	Simulation 2 (Live)
Total simulations completed	1.815	10.983
Unique participants	1.610	10.312
Participants with multiple attempts	205	671
Mean age (years)	21.93	21.05
User type		
– Upper secondary school students or graduates	1.359	8.854
– University students or graduates	249	1.388
– Missing data	–	70
Secondary school background available (n, %)	1,095 (68.01%)	6.813 (66.06%)
Most represented educational tracks	Scientific High School; Scientific High School – Applied Sciences; High School of Human Sciences; Language High School	Scientific High School; High School of Human Sciences; Scientific High School – Applied Sciences
Most represented regions	Lombardia; Emilia-Romagna; Sicilia	Lombardia; Sicilia; Puglia
Least represented regions	Molise; Basilicata	Valle d'Aosta; Molise
Participants indicating university preference (n, %)	1.600 (99.37%)	10.272 (99.61%)
Most selected universities	Ferrara; Milan; Sapienza Rome	Sapienza Rome; Catania; Milan
Most selected degree programs	Physiotherapy; Nursing; Medical Radiology Techniques	Nursing; Physiotherapy; Medical Radiology Techniques

3.2 Simulation 1: Event-Based Format

The first event-based simulation was freely available through the thefaculty application from July 31 to August 3. During this period, a total of 1815 simulations were completed, corresponding to 1610 unique participants. Among these, 205 students completed the simulation more than once; for analytical purposes, only the first attempt was retained.

The mean age of participants was 21,93 years. User segmentation data indicated that the sample included students from upper secondary schools or recent graduates (n = 1359) as well as university students or graduates (n = 249). Information on secondary school background was available for 1095 participants. Among these, the most frequently reported educational track was Scientific High School, followed by Scientific High School - Applied Sciences track, High School of Human Sciences, and Language High School. Additional contributions were recorded from Classical High School and Professional Institutes for Health and Social Care, alongside other educational pathways. In quantitative terms, participants included 172 students from Scientific High School, 120 from Scientific High School – Applied Sciences track, 115 from High School of Human Sciences, and 90 from Language High School, alongside 62 from Classical High School and 59 from Professional Institutes for Health and Social Care. Data showed participation from all Italian regions. The highest number of participants was recorded from Lombardia, Emilia-Romagna, and Sicilia, while Molise and Basilicata were the least represented regions. Most participants indicated a preferred university for taking the admission test, with preferences distributed across a wide range of institutions nationwide. The universities most frequently selected included the University of Ferrara, followed by the University of Milan and Sapienza University of Rome, with several other medium and large Italian universities also reporting substantial numbers of preferences. Additional preferences were distributed across numerous institutions, including the Universities of Sassari (n = 72), L'Aquila (n = 64), Brescia (n = 58), and Catania (n = 57), as well as Bari (n = 55), Bologna (n = 54), Cagliari (n = 54), Insubria (n = 54), Padova (n = 53), and Torino (n = 52), with further representation across several other Italian universities.

Participants were also able to indicate their preferred degree program. The most frequently selected programs were Physiotherapy and Nursing, followed by Medical Radiology Techniques, Speech and Language Therapy, and Midwifery. Preferences were also reported for other Health Professions programs, including Biomedical Laboratory Techniques and Dietetics, as well as less frequently selected programs such as Podiatry. Additional degree program preferences included Dental Hygiene (n = 106), Neuro and Psychomotor Therapy of Developmental Age (n = 97), Psychiatric Rehabilitation Techniques (n = 69), Neurophysiopathology Techniques (n = 55), Orthoptics and Ophthalmologic Assistance (n = 53), Pediatric Nursing (n = 48), and other less frequently selected programs such as Occupational Therapy (n = 12) and Podiatry (n = 5).

During the four-day event-based simulation conducted between late July and early August, the mean score achieved by participants was 22.68 out of 90. No participant achieved the maximum possible score. Most participants obtained scores within the range of 10 to 30 points. The distribution of scores showed fewer observations at the lower and upper extremes. This distribution reflects a concentration of participants within intermediate performance levels, with fewer individuals achieving either very low or very high scores.

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Completion time data indicated that most participants completed the simulation within 20 to 60 minutes, with a peak in completion frequency between 40 and 45 minutes. An additional peak was observed at 100 minutes, corresponding to the maximum time allowed for completing the simulation (Fig. 1-2).

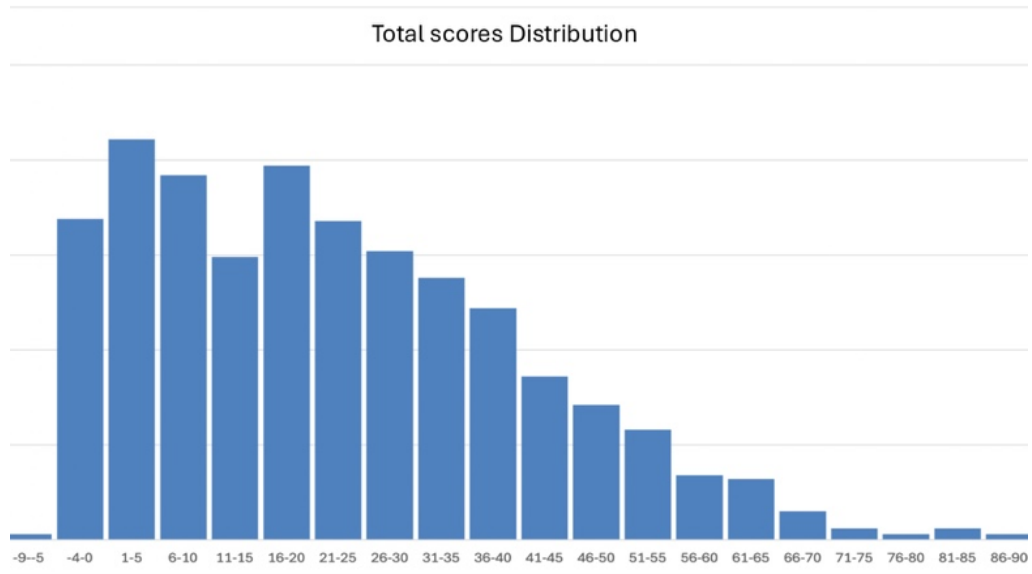


Figure 1. Total score distribution for Simulation 1

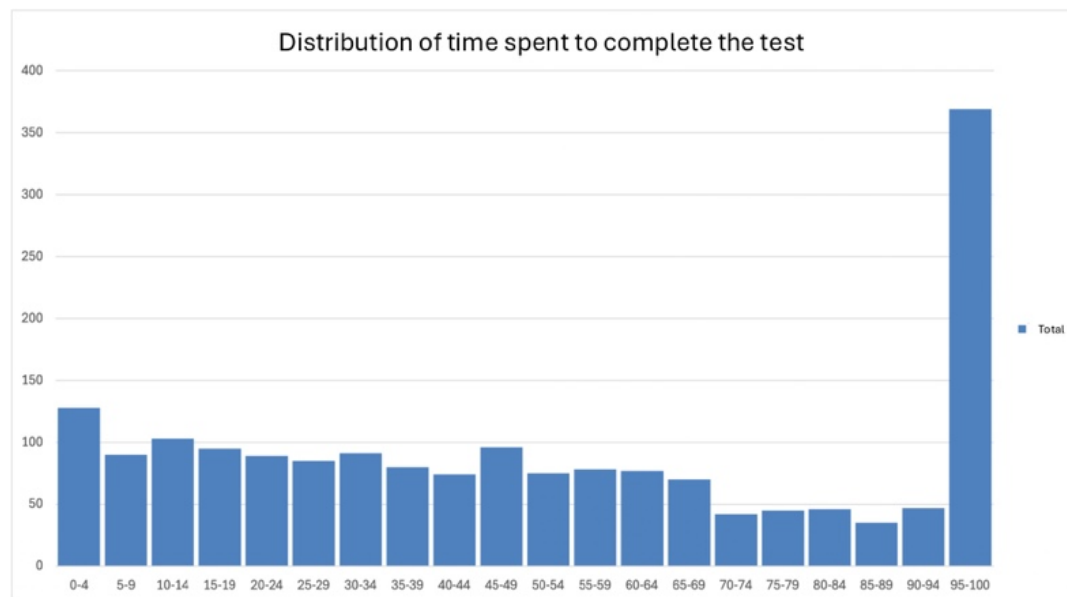


Figure 2. Distribution of time spent to complete the test for Simulation 1

3.3 Simulation 2: Live Format

The second simulation was conducted as a live event and was available starting at 1:00 p.m. on September 5, 2025. A total of 10983 simulations were completed, corresponding to 10312 unique participants. Among these, 671 students completed the simulation more than once.

The mean age of participants was 21.05 years. User segmentation data indicated that the sample included 8854 upper secondary school students or recent graduates and 1388 university students or graduates; user type information was missing for 70 participants. Information on secondary school background was available for 6813 participants. The most frequently reported educational track was Scientific High School, followed by High School of Human Sciences and Scientific High School - Applied Sciences track. Additional educational backgrounds included Language High School, Classical High School, Health Biotechnology programs, Professional Institutes for Health and Social Care, and High School of Human Sciences - Economic and Social Sciences track, among others. Most participants indicated a preferred university for taking the admission test. More specifically, the sample included 1411 students from Scientific High School, 798 from High School of Human Sciences, and 760 from Scientific High School – Applied Sciences track, as well as 518 from Language High School and 378 from Classical High School. Additional contributions were observed from Health Biotechnology programs (n = 352), Professional Institutes for Health and Social Care (n = 291), and High School of Human Sciences – Economic and Social Sciences track (n = 281). The most frequently selected institutions included Sapienza University of Rome, the University of Catania, and the University of Milan, followed by several other large and medium-sized Italian universities. Preferences were reported for a wide range of institutions across the national territory, including both major academic centers and smaller universities. Beyond the most frequently selected institutions, preferences were widely distributed across the national territory, including universities such as Bari (n = 477), Chieti–Pescara (n = 449), Torino (n = 408), Ferrara (n = 402), Padova (n = 386), Roma Tor Vergata (n = 378), and Napoli “Federico II” (n = 364), alongside numerous other medium-sized and smaller universities.

Participants also indicated their preferred degree program. The most frequently selected programs were Nursing and Physiotherapy, followed by Medical Radiology Techniques, Speech and Language Therapy, and Midwifery. Additional preferences were reported for Biomedical Laboratory Techniques and Dietetics, as well as for other Health Professions degree programs, including Neuro and Psychomotor Therapy of Developmental Age, Dental Hygiene, Pediatric Nursing, Psychiatric Rehabilitation Techniques, and other less frequently selected programs. Further preferences were observed for Neuro and Psychomotor Therapy of Developmental Age (n = 636), Dental Hygiene (n = 548), Pediatric Nursing (n = 401), Psychiatric Rehabilitation Techniques (n = 388), Neurophysiopathology Techniques (n = 277), Orthoptics (n = 269), and Occupational Therapy (n = 107), among others.

During the live simulation conducted on September 5, the mean score achieved by participants was 24.95 out of 90. One participant achieved the maximum possible score. The score distribution showed a negligible proportion of participants with very low or null scores. Completion time data indicated that most participants required medium to long durations to complete the simulation, with a marked peak at 100 minutes, corresponding to the maximum time allowed. A smaller proportion of participants completed the simulation in a very short time (Fig. 3-4).

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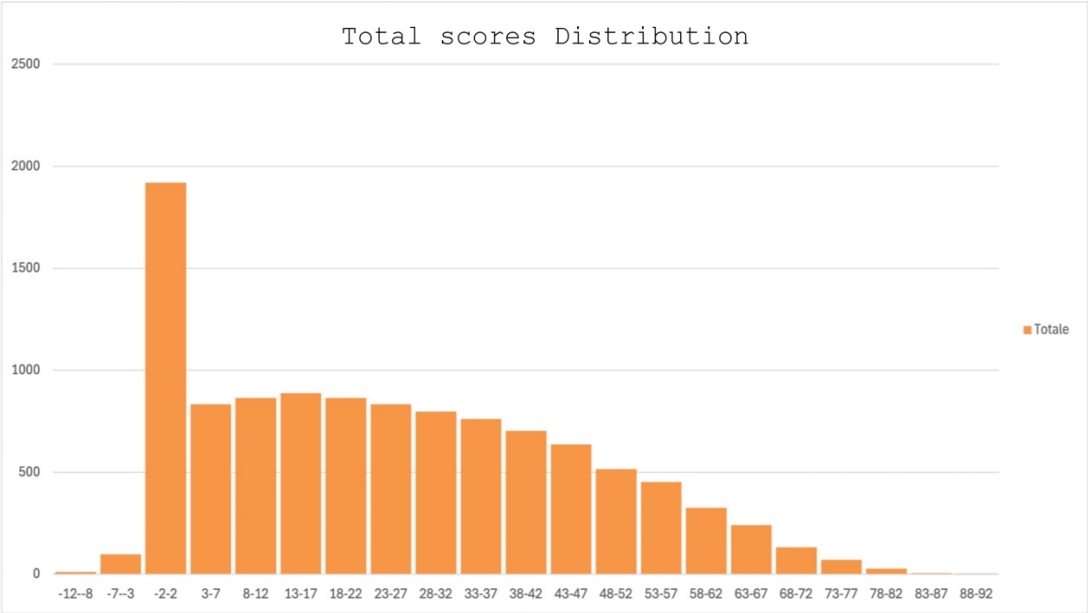


Figure 3. Total score distribution for Simulation 2

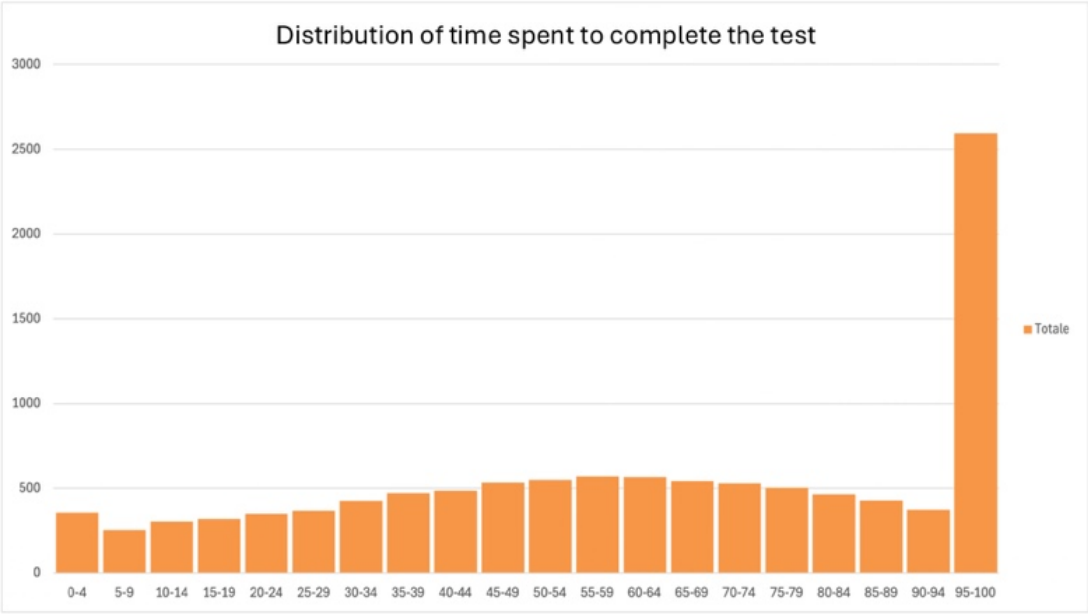


Figure 4. Distribution of time spent to complete the test for Simulation 2

3.4 Comparison Between Simulation Performances

The first event-based simulation recorded 1815 completed simulations, with a mean score of 22.69. The second live simulation recorded 10,983 completed simulations, with a mean score of 24.95. The difference between the two mean scores corresponded to an increase of 2.26 points. Among the 1185 participants who completed both simulations, 67.4% achieved a higher score in the second simulation compared to the first, 31.9% achieved a lower score, and 0.7% obtained the same score in both simulations.

Between January 1, 2025 and September 5, 2025, a total of 4296956 responses to training questions were recorded, provided by 34,075 students. Performance data were analyzed by subject area and by occurrence, defined as the number of times the same question was presented to the user. Mean performance varied across subject areas in the two simulations. In Simulation 1, average scores were 2.36/6 for basic skills and knowledge, 1.51/7.5 for logic, 11.96/34.5 for biology, 6.54/22.5 for chemistry, and 3.33/19.5 for mathematics and physics. In Simulation 2, corresponding values were 1.94/6, 2.08/7.5, 10.87/34.5, 7.20/22.5, and 4.90/19.5, respectively.

Across all subject areas, higher percentages of correct responses were observed from the second occurrence onward compared to the first. For basic skills and knowledge, the percentage of correct responses increased from 38.25% at the first occurrence to values above 71% from the second occurrence onward. For logic, an increase in correct responses was observed between the first and subsequent occurrences. For scientific subjects, including biology, chemistry, mathematics, and physics, correct response rates increased progressively across occurrences. Across the training dataset, mean percentages of correct responses were 46.39% for basic skills and knowledge, 56.04% for logic, 54.83% for biology, 51.05% for chemistry, and 50.17% for mathematics and physics. In mathematics and physics, correct response rates increased between the first and second occurrence and subsequently stabilized at approximately 67% (Fig. 5-6). A more detailed occurrence-based analysis showed that correct response rates increased from 38.25% to 71.26% in basic skills and knowledge between the first and second occurrence, stabilizing above 73% in subsequent exposures. Similar patterns were observed in logic (51.5% to 70.14%), biology (41.09% to 65.25%), chemistry (40.59% to 63.02%), and mathematics and physics (42.83% to 64.56%), with progressive increases across repeated attempts.

A detailed breakdown of correct response rates across successive occurrences for each subject area is reported in Table 2.

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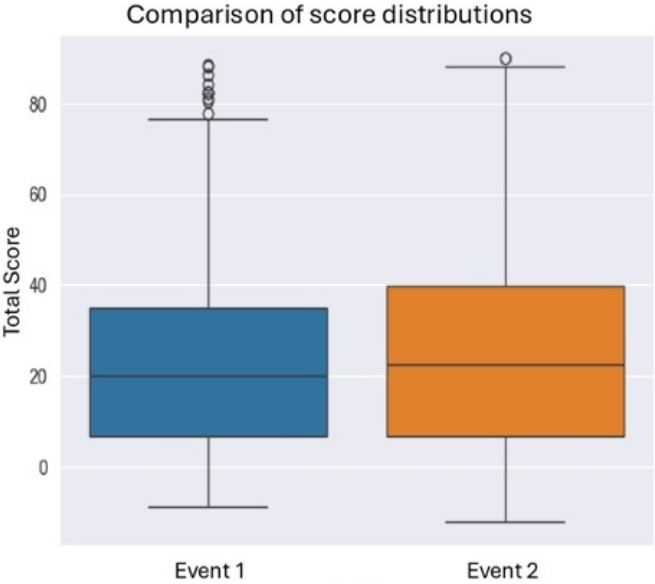


Figure 5. Comparison of score distribution

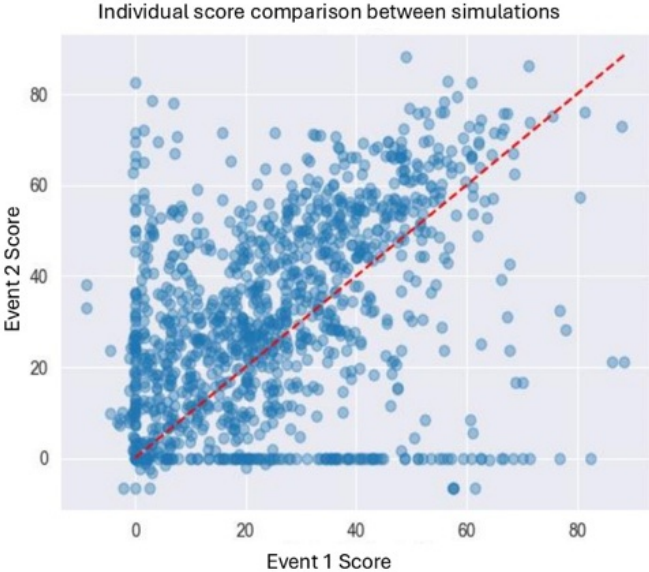


Figure 6. Individual score comparison between simulations

4. DISCUSSION

The present study describes the development and large-scale implementation of a digital simulation application designed to support preparation for the Italian admission test to Health Professions degree programs and reports early descriptive data from two nationwide simulation events. Overall, the results provide an initial overview of participation patterns, performance distributions, and training-related trends within a heterogeneous population of prospective applicants. The large volume of data collected, including both simulation-based performance and longitudinal training activity, further strengthens the descriptive value of the study by capturing user interaction patterns across different contexts and timeframes.

Both simulation formats attracted a broad and diverse sample of students, including individuals at different stages of their educational pathway and from a wide range of secondary school backgrounds and geographic regions. This heterogeneity reflects the real-world population typically involved in admission test preparation and supports the ecological validity of the collected data (Jeffrey et al., 2019). This heterogeneity is also reflected in the distribution of educational backgrounds and in the wide range of university and degree program preferences reported by participants, suggesting that the simulation reached a population representative of the broader applicant pool. The high level of participation observed, particularly in the live simulation, suggests a strong demand for structured preparation opportunities delivered through accessible digital platforms (Issenberg & Scalse, 2008). The marked increase in participation observed in the live simulation, compared to the event-based format, further highlights the potential of time-bound, high-salience digital events to engage large numbers of prospective applicants.

In terms of performance, mean scores increased from the first to the second simulation, and the comparison of participants who completed both events showed that a majority achieved higher scores in the second simulation. While causal inferences cannot be drawn from these descriptive data, this pattern is consistent with the hypothesis that repeated exposure to test-like conditions may be associated with improved familiarity with the assessment format and its cognitive demands. This interpretation is supported by the observed improvements in specific subject areas, particularly in logic and mathematics and physics, where higher average scores were recorded in the second simulation. At the same time, a substantial proportion of participants showed stable or lower scores across simulations, highlighting the variability in individual performance trajectories and suggesting that improvement is not uniform across all candidates (Patterson et al., 2017). In particular, the presence of participants with stable or decreased performance across simulations suggests that individual differences in baseline knowledge, learning strategies, and engagement with preparatory activities may influence performance trajectories.

The distribution of completion times further supports the interpretation that many participants engaged fully with the simulation tasks. In both simulations, a notable proportion of students used a substantial part of the available time, particularly in the live format, where a marked peak at the maximum time limit was observed. This finding is consistent with engagement in a full test attempt under realistic time constraints. The concentration of completion times near the upper limit, especially in the live simulation, may also reflect increased test-taking effort and adherence to the simulated examination conditions. The presence of a smaller group of participants completing the simulation very quickly suggests heterogeneous usage patterns, which may include exploratory access to the platform; however,

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the overall distribution indicates that the majority of users interacted meaningfully with the simulation environment.

Analysis by subject area revealed differences in performance patterns across domains, both in the simulations and in the training data. During in-app training activities, increases in correct response rates were observed from the second occurrence onward across all subject areas, with varying trajectories depending on content domain. More specifically, training data showed that response accuracy increased markedly between the first and second occurrence across all subject areas, with particularly pronounced gains in basic skills and knowledge and logic. These findings suggest that repeated exposure to questions within the digital environment is associated with measurable changes in response accuracy over time. At the same time, differences between subject areas suggest that certain domains, such as mathematics and physics, may require deeper cognitive processing and problem-solving strategies, leading to more gradual improvements compared to domains where recall-based learning may play a greater role. Differences observed between domains, particularly among scientific subjects, indicate that performance gains may follow different patterns depending on the nature of the content and the cognitive processes involved (*Health sciences and medical college preadmission criteria and prediction of in-course academic performance: a longitudinal cohort study* | *Advances in Health Sciences Education*, s.d.; Khan et al., 2013; Wilcox & Lawson, 2018). These patterns are consistent with the quantitative trends observed in the training dataset, where accuracy gains tended to stabilize after initial improvements, indicating a potential ceiling effect in repeated exposure conditions. An additional aspect emerging from the present study is the potential value of combining asynchronous and live simulation formats within the same digital environment. Rather than representing interchangeable delivery modes, these formats may support different stages and modalities of test preparation, with asynchronous access favoring flexible engagement and live administration more closely approximating the temporal structure of a high-stakes examination. These two contexts are likely to reflect different aspects of preparation and should not be considered interchangeable (Hrastinski, 2008). From an institutional perspective, aggregated data generated through digital simulation initiatives may also inform the planning of targeted orientation and preparatory strategies, particularly when participation occurs at national scale and across heterogeneous student profiles (Ferguson, s.d.).

Taken together, these early findings suggest that a digital simulation application can serve a dual role in the context of admission test preparation: as a formative tool for candidates and as a data-generating environment capable of capturing large-scale descriptive information on participation and performance. The integration of simulation data with longitudinal training data further enhances this dual role, allowing the simultaneous observation of performance under test-like conditions and learning dynamics during repeated practice. Importantly, the present study does not aim to establish predictive validity or causal effects of simulation or training on admission outcomes. Rather, it provides an initial empirical foundation for understanding how students interact with a structured digital simulation aligned with official test formats (Renger & Meadows, 1994). These findings contribute to the growing body of literature on digital assessment and simulation-based learning by providing large-scale, real-world data on how candidates engage with structured preparation tools in high-stakes educational contexts.

4.1 Limitations and Future Directions

Several limitations of this study should be considered when interpreting the results. Participation in the simulations was voluntary and conducted in a remote, unsupervised setting, which may have introduced self-selection effects and variability in testing conditions. Furthermore, the absence of direct control over participants' testing environments may have influenced engagement levels, time management, and response strategies, potentially affecting performance outcomes. In addition, the analyses were descriptive and exploratory, precluding causal inferences or conclusions regarding the predictive validity of simulation performance. In addition, the use of aggregated data limits the ability to explore individual-level predictors of performance or to control for potential confounding variables. Differences in test content between simulation events may have influenced comparisons across subject areas. Similarly, variations in item difficulty and content distribution between simulation events may have contributed to differences in subject-specific performance, limiting the direct comparability of scores across simulations. Moreover, the present study did not link simulation or training performance to official admission test outcomes, limiting conclusions about their relationship with real-world selection results. Additionally, although a large volume of training data was available, the present study did not examine how individual engagement with training functionalities influenced subsequent simulation performance, limiting insights into learning processes at the individual level.

Future research should address these limitations by examining longitudinal associations between digital simulation performance, training behaviors, and actual admission test outcomes. Such studies could help clarify the extent to which simulation-based performance reflects or predicts real-world assessment outcomes in competitive admission contexts. Further investigations could also explore psychometric properties of simulation-based assessments, including reliability and validity across different cohorts. In particular, future research could investigate item-level characteristics, internal consistency, and stability of performance across repeated simulations. Finally, integrating digital simulation data with additional educational and contextual variables may help refine the use of simulation tools as part of evidence-informed approaches to preparation and assessment for selection in Health Professions education. For example, variables such as frequency of training use, number of repeated question exposures, and patterns of engagement over time could be integrated into predictive models of performance. Moreover, future studies may explore how digital simulation platforms can be integrated into structured preparatory pathways or institutional guidance strategies to support equitable access to admission test preparation.

5. CONCLUSION

In conclusion, the development and implementation of the The Simulation Day digital application demonstrate the feasibility of delivering nationwide, standardized admission test simulations while simultaneously collecting early performance data at scale. The large-scale participation observed across both simulation formats, together with the extensive volume of training data collected, highlights the capacity of digital platforms to engage diverse student populations and generate robust datasets for analysis. These results support further investigation into the role of digital simulation tools within admission test preparation and their potential

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contribution to evidence-informed approaches to assessment for selection in Health Professions education. In addition, the observed patterns of performance across simulations and training activities suggest that such tools may provide valuable insights into learning processes, subject-specific difficulties, and variability in candidate preparedness within high-stakes admission contexts.

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