Impact of a Serious Game on the Intention to Change Infection Prevention and Control Practices in Nursing Homes during the COVID-19 Pandemic: Protocol for a Web-Based, Randomized Controlled Trial

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Submitted to: JMIR Research Protocols
on: November 10, 2020

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Abstract

Background: Nursing home residents are at high-risk of complications and death due to coronavirus disease 2019 (COVID-19). Lack of resources, both human and material, amplifies the likelihood of contamination in these facilities where a single employee can contaminate dozens of residents and colleagues. Improving the dissemination of and adhesion to infection prevention and control (IPC) guidelines is therefore essential. Serious games have been shown to be effective in developing knowledge and in increasing engagement and could motivate nursing home employees to change their IPC practices.

Objective: Our aim is to assess the impact of “Escape COVID-19”, a serious game designed to enhance knowledge and application of IPC procedures, on the intention of nursing home employees to change their IPC practices.

Methods: We will carry out a web-based, randomized controlled trial following the CONSORT-EHEALTH guidelines and incorporating relevant elements of the CHERRIES checklist. Participants will be randomized to either the control or the serious game (intervention) group. First, both groups will be asked to answer a questionnaire designed to gather demographic data and assess baseline knowledge. The control group will then access a quick reminder of the current national guidelines and links to IPC guidelines for healthcare professionals, while the other group will follow the game. Both groups will then have to answer a second questionnaire designed to assess their willingness to change their IPC practices after having followed their respective material. After completing this questionnaire, they will be granted access to the material presented to the group they were not assigned to and receive a course completion certificate. The primary outcome will be the proportion of participants willing to change their IPC practices according to group. Secondary outcomes will include the analysis of specific questions detailing the exact changes considered by the participants. Factors associated with participant willingness or reluctance to change behaviour will also be assessed. Attrition will also be assessed at each stage of the study.

Results: The study protocol has been presented to our regional ethics committee (Req-2020-01262), which issued a declaration of no objection as such projects do not fall within the scope of the Swiss federal law on human research. Data collection began on November 5th and should be completed by December 4th, 2020.

Conclusions: This study should determine whether “Escape COVID-19”, a serious game designed to improve compliance with COVID safe practices, modifies the intention of applying IPC guidelines in nursing home employees.

(JMIR Preprints 10/11/2020:25595)
DOI: https://doi.org/10.2196/preprints.25595

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Abstract word count: ##
Main text word count: ##
Table: 2
Figures: 8
References: ##

Funding: None

Keywords: covid-19, transmission, serious games, infection prevention, healthcare workers, sars-cov-2, nursing homes; randomized controlled trial

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Abstract

Background: Nursing home residents are at high-risk of complications and death due to coronavirus disease 2019 (COVID-19). Lack of resources, both human and material, amplifies the likelihood of contamination in these facilities where a single employee can contaminate dozens of residents and colleagues. Improving the dissemination of and adhesion to infection prevention and control (IPC) guidelines is therefore essential. Serious games have been shown to be effective in developing knowledge and in increasing engagement and could motivate nursing home employees to change their IPC practices.

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Conclusion: This study should determine whether "Escape COVID-19", a serious game designed to improve compliance with COVID safe practices, modifies the intention of applying IPC guidelines in nursing home employees.

INTRODUCTION

Background and Importance

Nursing home residents are at high-risk of complications and death if they develop coronavirus disease 2019 (COVID-19) after being infected with the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [1–4]. If infected, a single nursing home employee can potentially contaminate dozens of residents and colleagues [5], as allowing the virus to enter nursing homes leads to rapid inter-resident transmission [6]. Many long-term care facilities (LTCFs) were ill-prepared to face the first wave of the pandemic and should be helped as much as possible to prevent healthcare-associated transmission during the next potential waves [7]. Such waves seem all the more likely as new COVID-19 cases have been identified since September 2020 in LTCFs located in Geneva, 14 weeks after the last infection was diagnosed in this area [8]. In addition to helping fight the pandemic and avoid infection, showing a high level of support to nursing home employees may also enhance their motivation [9]. Indeed, since the start of pandemic, many authors have pointed out the dramatic lack of resources, both human and material, faced by many LCTFs [10–13].

In nursing homes as in other facilities, viral transmission is often facilitated by suboptimal application of infection prevention and control (IPC) guidelines [14]. Accordingly, a recent systematic review has identified the promotion of hand and respiratory hygiene and the use of appropriate personal protective equipment (PPE) to be some of the most critical IPC practices that could help prevent viral transmission among nursing home residents and staff [15]. Dissemination of these guidelines and practices might however be hampered by the current need for physical and social distance [16]. Moreover, application of IPC guidelines may be jeopardized by the presence of divergent and sometimes contradicting messages [17,18], and even by mistrust in guidelines issued by healthcare authorities [19].

The probability of actually executing an action is strongly linked to the intention of performing it [20]. By increasing engagement and developing knowledge [21,22], serious games could prove instrumental regarding the effective dissemination of IPC guidelines and the promotion of COVID-19 safe practices [23,24]. Using Nicholson's concept of meaningful gamification [25], we recently developed "Escape COVID-19", a serious game specifically designed to motivate healthcare workers adopt good IPC practices [26]. Indeed, building and strengthening their intrinsic motivation might be at least as important as reminding them of the most current guidelines to help avoid infection [27]. The usefulness and cost-effectiveness of computer-based serious games is however still debated, and previous studies have pointed out a considerable lack of evidence regarding this education modality [28].

Objective

Our principal aim is to assess the impact of this serious game on the intention of nursing home personnel to change their IPC practices. We will also seek to determine the factors explaining the reasons motivating the change and those explaining the lack of willingness to change behavior.

METHODS

Study Design and Setting

We will carry out a web-based, triple-blind (investigator, participants, data analyst), randomized controlled trials following the CONSORT-EHEALTH guidelines [29]. Elements from the CHERRIES checklist will be included when relevant [30]. The design and sequence are summarized in Figure 1.

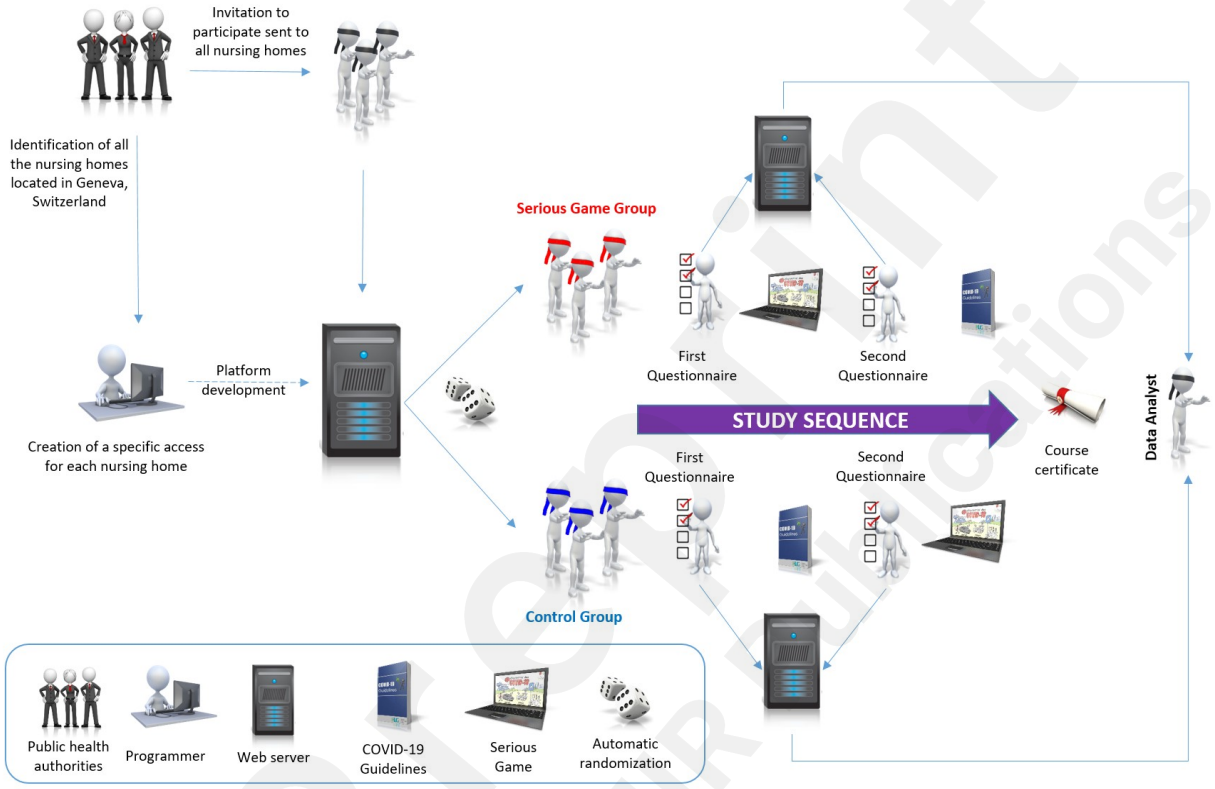

Figure 1. Study design and sequence.

A list of all the nursing homes located in Geneva, Switzerland, was obtained through the public health authorities of Geneva. All the staff of these nursing homes will be invited to take part in this study, on a voluntary basis, regardless of their professional status. Information regarding the study and its objectives, including data security, will be provided. Consent will be gathered electronically.

Online Platform

A specific and fully automated platform created under the latest version of the Joomla content management system [31] and hosted on a Swiss server will be used in this study. All data will be stored on an encrypted MySQL compatible database. Only one author (LSu) will be able to access the database. The platform will be secured by the RSFirewall (RSJoomla) [32] and Admin Tools (Akeeba) [33] components. The questionnaires will be administered using Community Surveys Pro (Corejoomla) [34], which allows for the use of branching logic and for the export of responses in CSV format. The Membership Pro (Joomdonation) component will be used to handle registrations [35]. Randomization will be achieved by the GegaByte Random Article module (GegaByte technologies) [36]. Therefore, randomization will be fully automated, and there will be no way participants or investigators could use to influence group allocation.

Accesses to the different steps of the study sequence will be managed through Joomla's native access

control list (PHP functions JUserHelper::addUserToGroup and JUserHelper::removeUserFromGroup). PHP functions will be embedded using Sourcerer (Regular Labs) [37]. Redirect-on-Login (Pages-and-Items) will be used to allow users to immediately access the appropriate section when resuming their study path [38]. Certificates will be generated using RSForm!Pro (RSJoomla) [39]. Daily backups will be scheduled using a cron job script and uploaded on a physically separate server through an encrypted connection.

First Questionnaire

Participants will be asked to fill in two questionnaires. Immediately after activating their account, a first questionnaire will be displayed. This questionnaire is designed to gather demographic data and to assess the initial level of knowledge regarding SARS-CoV-2 transmission and IPC guidelines. To limit attrition, the number of initial questions will be kept at a minimum and branching logic will be used to avoid displaying irrelevant items. The structure of this first questionnaire, the original questions (in French) and their translation (in English) are displayed in Table 1.

Table 1. First questionnaire, designed to gather demographic data and assess baseline knowledge of nursing home employees.

Page	Field	Original Question	English Translation
1	Demographics	Vous êtes: - Un homme - Une femme	You are: - A man - A woman
		Quel est votre âge?	What is your age?
		Vous faites principalement partie du personnel: - Médical - Soignant - Administratif/support - Autre [a]	You are mainly part of the: - Medical staff - Nursing staff - Administrative/support staff - Other [a]
		Vous êtes:[b] - Infirmier.e - Assistant.e en soins et santé communautaire - Aide-soignant.e - Physiothérapeute - Autre [a]	You are:[b] - Nurse - Nursing assistant - Healthcare assistant - Physiotherapist - Other [a]
		Vous êtes en contact avec des patients:[c] - Très fréquemment - Assez fréquemment - Peu fréquemment - Quasiment jamais	You are in contact with patients :[c] - Very frequently - Quite frequently - Seldom - Almost never
		Depuis combien d'années travaillez-vous dans le domaine de la santé?	For how many years have you worked in healthcare?
2[d]	Baseline knowledge	Vous vous apprêtez à entrer dans la chambre d'un patient COVID-19 **qui n'est pas sous CPAP** pour lui prodiguer des soins, quels équipements de protection sont nécessaires?	You are about to enter a room to care for a COVID-19 patient **who is not receiving CPAP treatment**. What protective equipment should you wear? - Face mask

		- Masque médical - Surblouse - Gants - Tablier de soins - Protection oculaire - Masque ultrafiltrant (FFP2)	- Gown - Gloves - Protective apron - Eye protection - N95 mask
		Vous vous apprêtez à entrer dans la chambre d'un patient COVID-19 **qui est sous CPAP** pour lui prodiguer des soins, quels équipements de protection sont nécessaires? - Masque médical - Surblouse - Gants - Tablier de soins - Protection oculaire - Masque ultrafiltrant (FFP2)	You are about to enter a room to care for a COVID-19 patient **who is under CPAP**. What protective equipment should you wear? - Face mask - Gown - Gloves - Protective apron - Eye protection - N95 mask
		Quelle est durée médiane d'incubation du COVID-19 (en jours)? - 2-3 jours - 4-6 jours - 7-10 jours - 11-14 jours	What is the median incubation time of COVID-19 (in days)? - 2-3 days - 4-6 days - 7-10 days - 11-14 days
		Parmi les situations suivantes, lesquelles doivent conduire à porter un masque ultrafiltrant (FFP2) chez un patient COVID-19 (confirmé ou suspecté)? - Auscultation d'un patient COVID-19 qui tousse - Traitements par nébulisation - Oxygénation à haut débit - Séance de physiothérapie de rééducation à la marche - Oxygénothérapie nasale à moins de 2L/min	In which of the following situations should you wear an N95 respirator mask when taking care of patient with a COVID-19 infection (confirmed or suspected)? - Auscultation of a coughing COVID-19 patient - Nebulization therapy - High flow oxygen therapy - Gait rehabilitation physiotherapy session - Nasal oxygen therapy (flow less than 2L/min)
		Parmi les suivantes, dans quelles situations le port de protections oculaires est-il recommandé ? - En cas de contact anticipé avec un liquide biologique par éclaboussure - En cas de contact de proximité avec un patient qui présente de symptômes respiratoires, même en	In which of the following situations should you wear eye protection? - If contact with a biological liquid (splashing) is anticipated - In case of close contact with a patient with respiratory symptoms, even without a diagnosis of COVID-19

		l'absence de diagnostic de COVID-19 - En tout temps dans la chambre d'un patient COVID-19 - En tout temps dans toute situation dans tous les lieux de l'établissement de soins	- Anytime when in the room of a COVID-19 patient - At all times in any situation in all areas of the care facility
2e	Baseline knowledge	Dans les lieux communs de l'institution, quels équipements de protection doivent être portés lorsque la distance de 1.5 m ne peut pas être respectée? - Le masque médical - Les gants - Le masque ultrafiltrant (FFP2) - Les protections oculaires - La surblouse	In the common areas of the institution, what protective equipment should be worn when the distance of 1.5 m cannot be respected? - A face mask - Gloves - An N95 respirator - Eye protection - A protective gown
		Parmi les suivantes, dans quelles situations le port de protections oculaires est-il recommandé ? - En cas de contact anticipé avec un liquide biologique par éclaboussure - En cas de contact de proximité avec un patient qui présente de symptômes respiratoires, même en l'absence de diagnostic de COVID-19 - En tout temps dans la chambre d'un patient COVID-19 En tout temps dans toute situation dans tous les lieux de l'établissement de soins	In which of the following situations should you wear eye protection? - If contact with a biological liquid (splashing) is anticipated - In case of close contact with a patient with respiratory symptoms, even without a diagnosis of COVID-19 - Anytime when in the room of a COVID-19 patient At all times in any situation in all areas of the care facility
		Si vous vous trouvez dans la même pièce qu'un patient atteint de COVID-19 qui est sous CPAP, vous devez porter un masque ultrafiltrant (FFP2) - Vrai - Faux	If you are in a room with a COVID-19 patient who is under CPAP, you must wear an N95 respirator mask - True - False
		Le bio-nettoyage standard de la chambre d'un patient COVID-19 nécessite l'utilisation d'un désinfectant standard (Des-sur®) - Vrai	Standard bio-cleaning of a COVID-19 patient's room requires the use of a standard disinfectant (Des-sur®) - True

		- Faux	- False
3	Symptoms and screening	Si j'ai des symptômes compatibles avec le COVID-19 : - J'attends de voir l'évolution et en cas de persistance des symptômes je vais me faire tester - Je vais me faire tester le jour même - Si les symptômes sont légers, j'attends que les symptômes passent et je continue de travailler sans faire de test	If I have symptoms compatible with COVID-19: - I monitor their evolution and get tested if the symptoms persist - I get tested right away (on the same day) - If the symptoms are mild, I wait for the symptoms to recede and continue to work without getting tested
		Parmi les symptômes suivants, quels sont ceux qui devraient vous conduire à faire un test de dépistage du COVID-19? - Rhume - Eruption cutanée - Toux - Maux de gorge - Perte de l'odorat - Maux de tête	Which of the following symptoms should prompt you to get tested for COVID-19? - Symptoms compatible with a "cold" - Skin rash - Cough - Sore throat - Loss of smell - Headache

[a] answering "other" allows the participant to enter free text in a specific field
[b] displayed only to participants who identify as part of the "nursing staff"
[c] displayed only to participants who identify as part of the "administrative/support staff" or as "other"
[d] these questions are only displayed to members of the medical or nursing staff
[e] these questions are only displayed to participants who identify as part of the "administrative/support staff" or as "other"

Serious Game

The experiment will be version 2.1.1 of the "Escape COVID-19" serious game [26] which is freely available on the internet [40]. This serious game has been created under Storyline 3 (Articulate Global) and can be played on many different platforms, including smartphones and tablets, thanks to its HTML5 compatibility. The game was designed using the SERES framework [41] and Nicholson's RECIPE for meaningful gamification [25]. It is made of 4 different levels representing typical phases which most healthcare employees experience daily. To make the game more engaging, the graphics included in the game were designed by Eric Buche, a well-known Swiss cartoonist [42].
Throughout the game, players are asked to make choices (Figure 2) or to answer questions directly related to the exposition element (Figure 3), which aims at creating a meaningful narrative in the serious game [25].

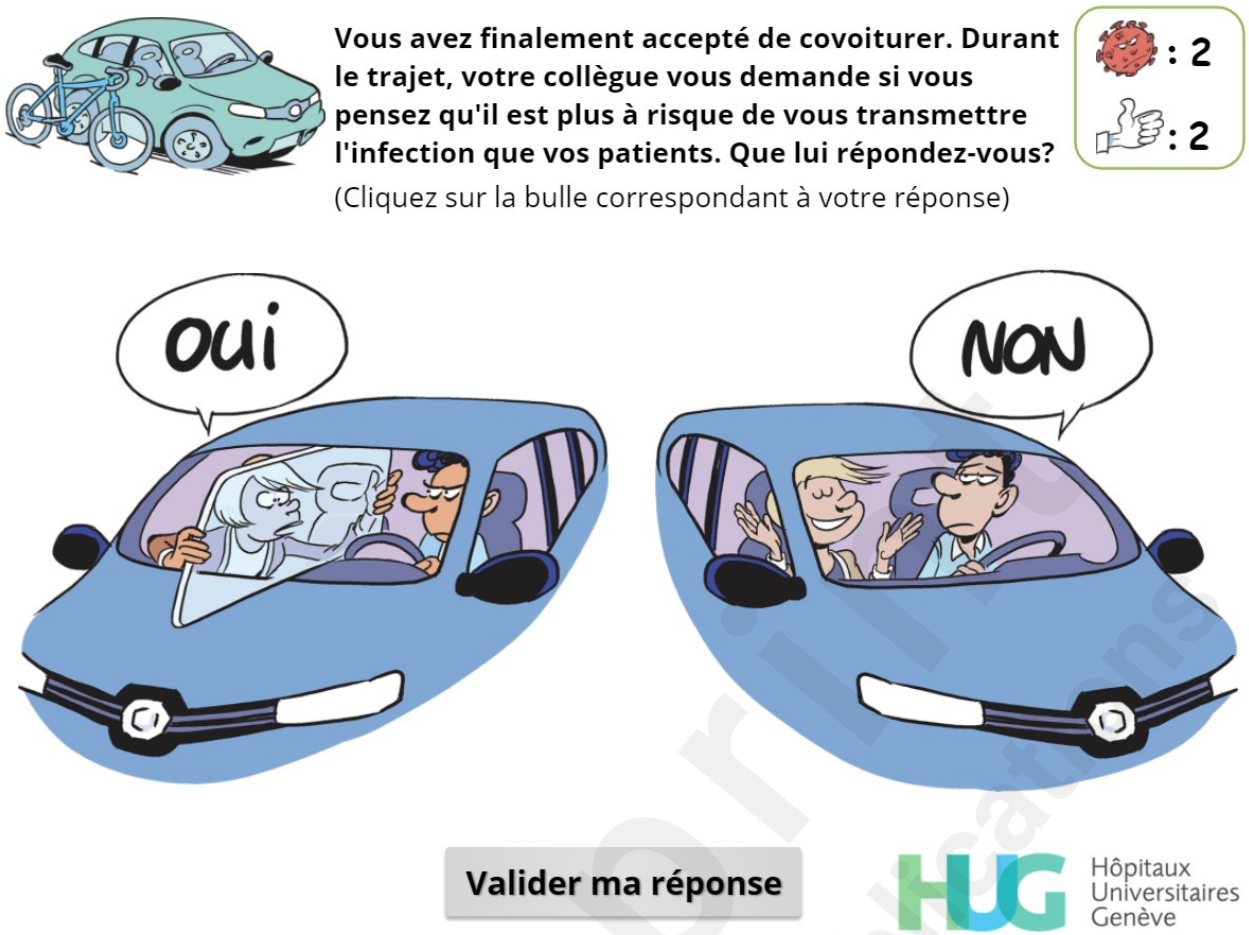

Figure 2. Simple choice interaction.

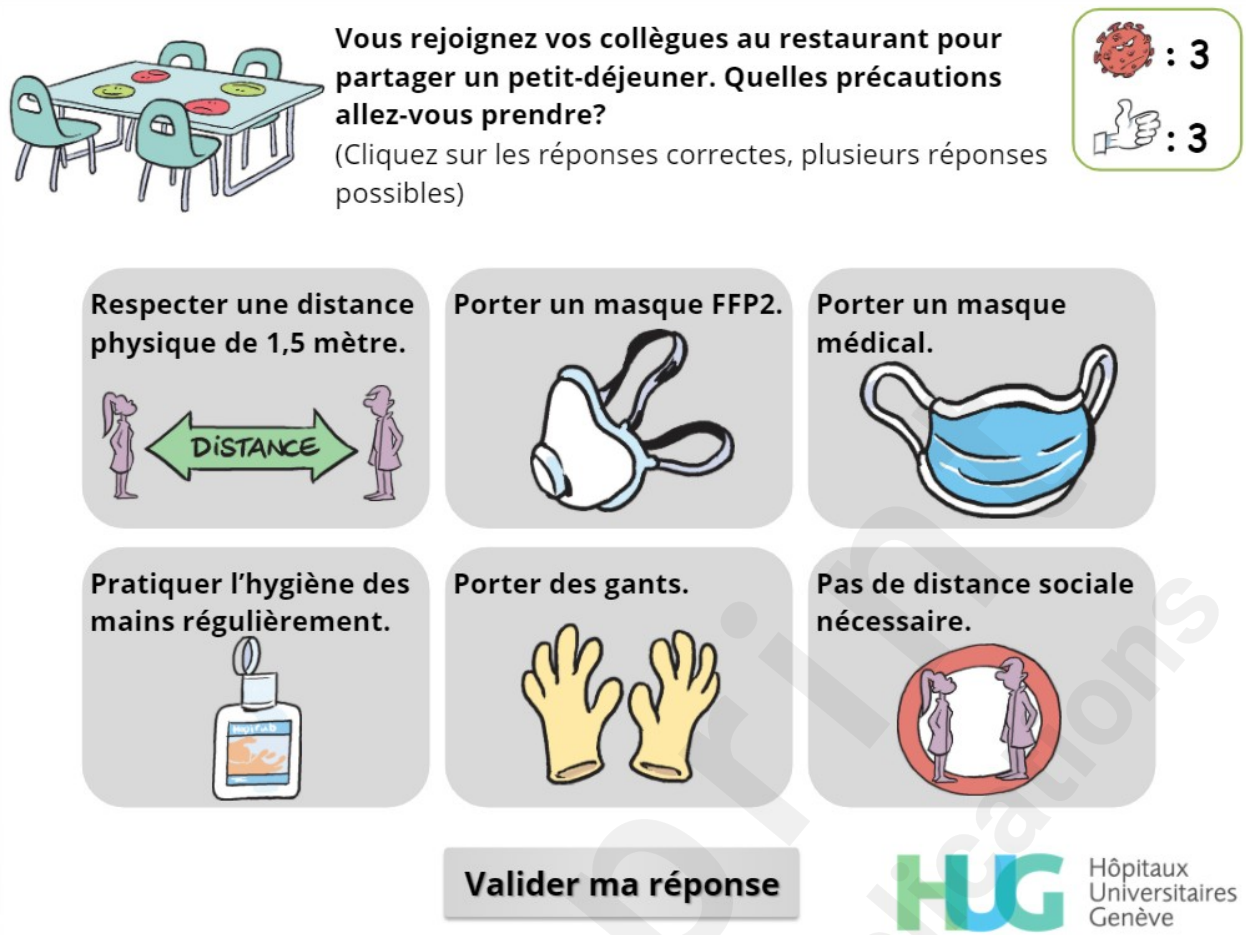

Figure 3. The player has to identify the precautions they should take when joining their colleagues for breakfast.

Feedbacks are used extensively [43] to allow the player to correct an answer (Figure 4) and to reinforce the expected behaviour (Figures 5-7).

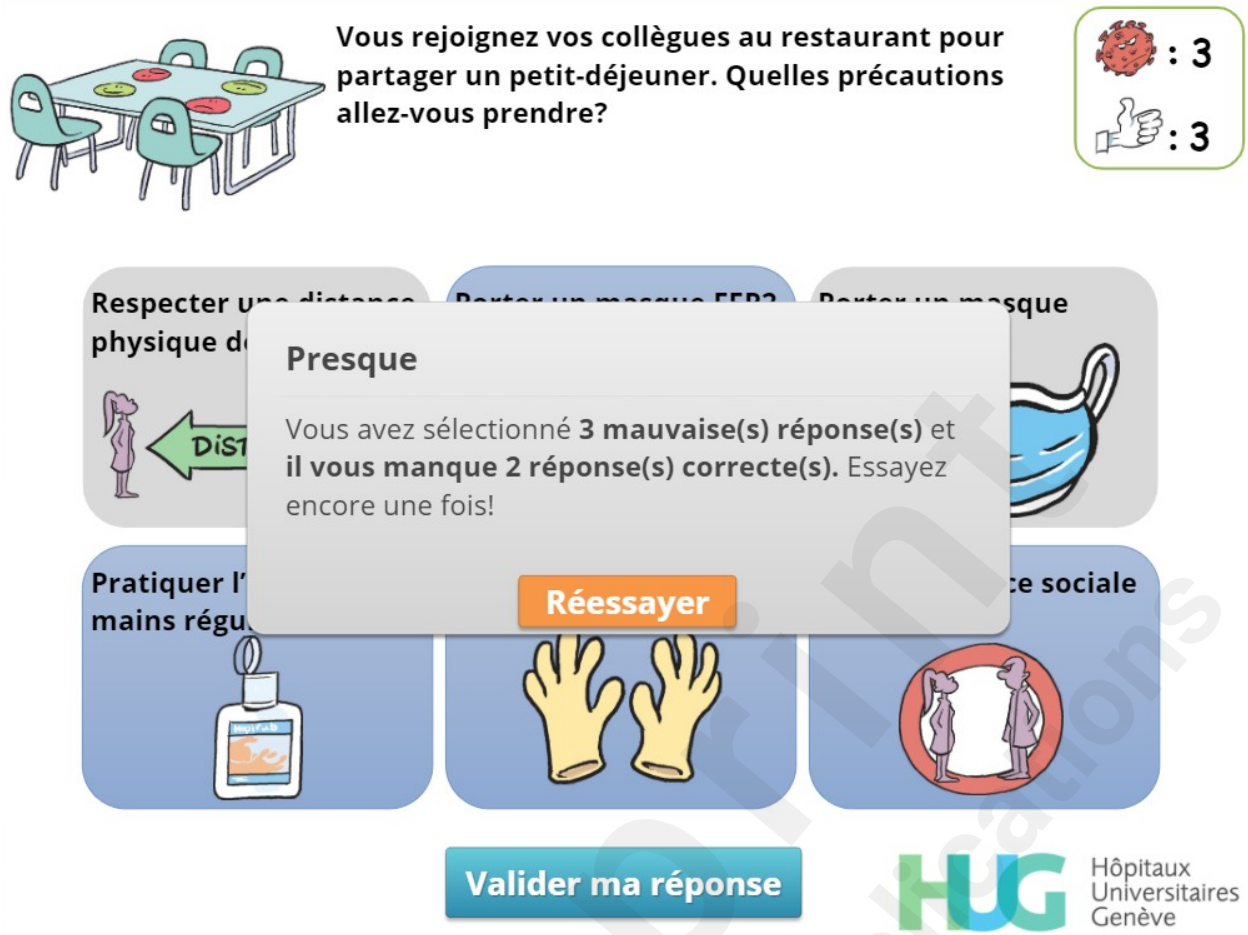

Figure 4. Feedback. The player has submitted a first answer and is informed that they have selected 3 wrong answers (“3 mauvaises réponses”) and that 2 correct answers are missing (“il vous manque 2 réponses correctes”). They can retry (“Réessayer”) once.

Figure 5. Feedback. The user has correctly answered the question. Visual hints related to the correct answers are displayed (mask, distance arrow, alcohol-based handrub) and a short text emphasizes the expected answers. A "thumbs up" image and a "plus" sign appear, rise, and progressively fade out before the thumbs-up count is updated.

Figure 6. Feedback. The player has retried but has failed to identify the correct answers. Visual hints related to the correct answers are displayed (mask, distance arrow, alcohol-based handrub) and a short text emphasizes the expected answers, which will be displayed when the player clicks on continue (“Continuer”). A virus and a “plus” sign appear, rise, and progressively fade out before the virus count is updated.

Figure 7. Feedback. When the user has failed to correctly answer the question, the correct answers are displayed over a green background.

Each time the player performs a desirable action or selects the correct answer, a “thumb up” is awarded. Conversely, the player gets a red virus for each wrong answer or unwished-for behaviour. If the player accumulates a total of 5 viruses, a game over screen is displayed (Figure 8). The player can then choose to spend their thumbs-up to decrease the virus count (1:1) or to restart the level.

Figure 8. Game over screen. The player has accumulated 5 viruses, and can either spend thumbs-up to decrease the virus count or restart the level.

Control materials

The control materials include a quick reminder of the current national guidelines published by the Federal Office of Public Health of the Swiss Confederation [44] and links to IPC guidelines for healthcare professionals (Vigigerme®) provided by the Geneva University Hospitals and freely available on the internet [45].

Second Questionnaire

The second questionnaire is designed to assess whether the participants intend to change their IPC practices after completing the first set of learning materials. Therefore, the control group will complete it after seeing the standard guidelines, and the serious game group after finishing the game. Once again, branching logic will be used to try to limit attrition.

Table 2. Second questionnaire, designed to determine the intention of changing prevention infection and control practices in nursing home employees.

Original Question	English Translation
Après avoir vu ce matériel de formation/information, allez-vous modifier certaines de vos pratiques de prévention de l'infection? - Oui - Non	After seeing this training / information material, are you going to change any of your infection prevention practices? - Yes - No
Quels domaines ces changements vont-ils concerner?[a,b]	What areas will these changes affect? [a,b] - Not going to work if you have symptoms

- Le fait de ne pas aller au travail si vous présentez des symptômes compatibles avec le COVID-19 - Le fait de vous protéger autant de vos collègues que de vos patients - La séquence d'habillage lors de procédures AVEC risque d'aérosolisation - La séquence d'habillage lors de procédures SANS risque d'aérosolisation - Le fait de changer plus fréquemment de gants non stériles - Le fait de vous désinfecter les mains plus fréquemment - Le fait de désinfecter votre place de travail - Le fait de manipuler le masque médical avec plus de précautions - Le fait de vous protéger également des personnes asymptomatiques	compatible with COVID-19 - Protecting yourself from both your colleagues and your patients - The donning sequence when dealing with procedures CARRYING a risk of aerosolization - The donning sequence when dealing with procedures NOT CARRYING a risk of aerosolization - Changing non-sterile gloves more frequently - Practicing hand hygiene more frequently - Disinfecting your workplace - Handling the face mask more carefully - Protecting yourself from asymptomatic people as well as from symptomatic ones
Vous allez désormais employer: [a,c] - Les masques médicaux - Les masques FFP-2 - Les protections oculaires - Les gants non stériles	You are now going to use: [a,c] - Face masks - N95 respirator masks - Eye protections - Non-sterile gloves
Qu'est ce qui a grandement participé à votre intention de modifier vos pratiques? [a] - L'information contenue dans le matériel de formation - Le sentiment de jouer un rôle important dans l'effort commun contre l'épidémie - La probabilité de contaminer un proche - Il faut suivre les procédures - Autre [d]	Which of these elements greatly contributed to your intention to modify your practices? [a] - The information given in the training material - The feeling of playing an important role in the common effort against the epidemic - The probability of infecting a relative - One should follow the procedures - Other [d]
Pour quelles raisons vos pratiques ne changeront-elles pas? [e] - Le matériel que je viens de consulter était inadapté à ma situation - J'applique déjà toutes les mesures proposées - Le matériel que je viens de consulter n'était pas utile - Je ne crois pas que ces mesures soient utiles - Je suis en désaccord avec les mesures proposées [d] - Autre [d]	Why will your practices not change? [e] - This material was not in line with my situation - I already apply all these guidelines - The material I have just seen was not helpful - I do not believe these measures to be useful - I disagree with these measures [d] - Other [d]

Qu'est-ce qui aurait pu favoriser la modification de vos pratiques? - Mieux comprendre les raisons justifiant les recommandations - Une probabilité plus importante de contaminer un proche - Le sentiment que vous avez un role important dans l'effort commun contre l'épidémie - Autre [d] - Rien - aucun argument ne pouvait me convaincre	What could have motivated you to change your practices? - Better understand the reasons behind the recommendations - A greater probability of infecting a relative - The feeling of having an important role in the common effort against the epidemic - Other [d] - Nothing – I could not have been convinced by any argument

[a] Question displayed only to participants who answered they were going to change their practices
[b] Answers based on a 6-point Likert scale (from 1, “not at all”, to 6, “very much”)
[c] Answers based on a 5-point Likert scale (from 1, “much less”, to 5, “much more”)
[d] ticking this option allows the participant to enter free text in a dedicated field
[e] Question displayed only to participants who answered they were not going to change their practices

All multiple-choice and multiple-answer questions are mandatory. A completeness check will be performed at the end of each survey page. Mandatory questions will be highlighted and will have to be answered before allowing participants move on to the next step. There will be no way to change the answers after completing a page.

Outcomes

The primary outcome will be the proportion of nursing home employees reporting they are willing to change their IPC practices according to group.

Secondary outcomes will be a composite of the questions based on the 6-point Likert scale and a composite of the questions based on the 5-point Likert scale according to group. Each individual question will also be assessed. We will also aim at identifying the factors associated with participant willingness to change their behaviour, and analyse the reasons given by participants opposed to changing theirs [46].

We will also assess attrition at each stage of the study according to group [47–50].

Participants and Sample Size

Health authorities were asked for a comprehensive list of the email addresses of all nursing home employees working in Geneva, Switzerland, which will represent a convenience sample. We decided to include all employees, regardless of their professional status or of the potential specificities of the facilities they worked in, without any exclusion criterion. To detect a difference of 10% at the .05 significance level with a power of 80%, 388 participants will be needed in each group. The number of eligible employees is estimated to near 4’000 people. Therefore, a participation rate of around 20% will be required.

All employees will be invited to participate regardless of their professional status. Participation will be encouraged by delivering a course completion certificate upon completing the study path. No financial incentive will be provided.

To avoid potential duplicates, participants will be required to register on the site using a valid email address. No other personal information, including their names, will be asked for during the registration process. The system will automatically send an activation email to check whether the email address provided is valid. Participants will be told that using the activation links will be

considered as consent to participate in the study.

Statistical Analysis

Stata 15.1 (StataCorp LLC) will be used for data curation and statistical analysis. Data will be curated by LSu and neutral names will be randomly assigned to the control and serious game groups before transferring the DTA file to the blinded data analyst (LSt). To avoid any potential conflict of interest, the analyst was no part of the serious game development team and did not participate in the original publication describing its development. There will be no interim analysis.

Incomplete answer sets will be excluded. Imputation techniques will not be used. Answer sets marked as completed should not contain any missing value by virtue of completeness checks automatically performed by the survey component.

Univariate and multivariable logistic regression will be used to assess the primary outcome. Adjustment will be done according to prior knowledge (expressed as percentage of correct answers), professional status, and nursing home. The expected sample size should prevent overfitting. We will check the log-linearity assumption graphically and test the goodness-of-fit using the Hosmer-Lemeshow test.

The analysis of secondary outcomes will be carried out by assigning numerical values to the answers gathered through the use of Likert scales. As the 6-point Likert scale ranges from 1, “not at all”, to 6, “very much”, the same numbers i.e., a score ranging from 1 to 6, will be used for each item. The composite outcome will be the sum of the 9 questions and will be analysed using univariate and multivariable linear regression analyses, with the same adjustment variables as the primary outcome). Each question will be analysed separately.

For the 5-point Likert scale, values ranging from -2 to +2 will be assigned to each answer, with positive values attributed to changes enhancing IPC behaviour. A composite outcome will be generated that will be the sum of these values. We made the choice to treat this discrete variable as continuous and use a linear regression analysis, first univariate then multivariable (with the same adjustment variables as the primary outcome). The same weight will be applied to all questions when computing composite outcomes. As a reduction in the use of N95 respirator masks can also be considered as enhancement depending on the setting, a sensitivity analysis will be done by analysing the composite outcome with and without the N95 respirator masks item.

Descriptive statistics will be used to detail the factors associated with participant willingness to change or refuse to change behaviour. Student t-test and the chi-squared test will be used to assess differences between groups.

The curated data file will be made available on the Mendeley Data repository.

RESULTS

The study protocol has been presented to our regional ethics committee (Req-2020-01262), which issued a declaration of no objection as such projects do not fall within the scope of the Swiss federal law on human research [51]. The public health authorities of Geneva did not have access to a list of email addresses of all nursing home employees. They however provided us with a comprehensive list of all nursing homes to allow us to create specific accesses for each nursing home. They were reluctant to provide us with the email addresses of nursing home managers, but were nevertheless willing to send information and invitation emails on our behalf.

The online platform was finalized on November 3rd, 2020 [52]. It was created by LSu and MS and thoroughly tested by all co-authors. We provided the healthcare authorities with a generic email template (Multimedia Appendix 1) and a list of nursing home specific accreditations, which acted as passwords to prevent participants to enlist under the wrong nursing home. This email template informed the recipients that, should they accept to participate, all data would be processed anonymously but could and would be used for research purposes. The email stated that the study path would let participants access IPC guidelines as well as a serious game, but did not tell them in which order these materials would be accessed. The approximate time required to complete the whole path (30 minutes) was given, along with an email address that could be used to contact the investigators. Participants were also told that they would receive a course completion certificate after completing the study path.

Data collection began on November 5th, 2020, and is scheduled to end on December 4th, 2020.

DISCUSSION

Main considerations

This study should help determine whether a serious game can improve the adoption of IPC guidelines among nursing home personnel. This game should appeal to at least three of the four types of players described by Bartle in 1996 [53]: achievers, who might want to gather all the thumbs while avoiding getting a single virus to get the “highest” score; explorers, who might find the narrative created through the use of the exposition element of Nicholson’s RECIPE appealing; and socializers, who might associate the use of thumbs with the use of social networks. Nevertheless, some participants might be recalcitrant to this kind of intervention. Identifying the profile of these participants and the reasons underlying their resistance to change could help either improve the game or devise better targeted interventions [46]. Conversely, the identification of factors enhancing the adoption of safe IPC practices will help explore ways of strengthening COVID-19 safe messages.
To avoid a potential conflict of interest as 5 of the authors of this protocol were also members of the team which developed the serious game, the data analyst, who will be blinded, was not part of the development team.

Limitations

Some limitations can already be anticipated. First, as we were unable to obtain a comprehensive list of all potential participants, and because we cannot be sure that nursing home managers will actually transmit the information to their personnel, we will be prevented from determining the actual number of potential participants. While this could lead us to underestimate the participation rate, another mechanism could result in overestimating this rate. Indeed, we will have no way of preventing nursing home specific accreditations to be transferred to third parties, and some participants might not be part of the target population. To alleviate this concern, we will, upon request, create specific accreditations to allow other categories of personnel to create accounts on the platform and follow the study path. Any data gathered through the use of such accreditations will not be included in the analysis.
Despite its design, which is intended to attract different types of players, this serious game might be more successful in certain specific profiles. Because we decided on a limited number of questions to try to limit attrition, we elected not to include questions pertaining to the identification of the player type. Other studies would therefore be needed to explore a potential correlation.
The convenience sample used in this study might not be representative of other systems. Moreover, even though only 20% of the target population will be required to participate to reach our estimated sample size, we cannot be certain of the participation rate. A low participation rate will intrinsically carry the risk of a selection bias.
Another important limitation is that, even though the theory of planned behavior has proven its worth in the field time and again, we will have no way of proving that the intention of adopting COVID-19 safe IPC practices correlates with actual change in the field. Direct observations should be performed to ascertain this fact, but our limited human resources and next to non-existent funds will prevent us from carrying such observations as part of the present study.
Finally, the importance of rapidly deploying this study and the serious game did not allow us to wait for the peer-review process to be completed before proceeding with the study. Therefore, we will be unable to change either the study design or the questionnaires despite the valuable input the reviewers will provide us with.

CONCLUSION

This study should determine whether “Escape COVID-19”, a serious game designed to improve compliance with COVID safe practices, modifies the intention of applying IPC guidelines in nursing homes.

Acknowledgements

The authors would like to warmly thank Mr. Eric Buche who designed all the magnificent graphical elements used in the “Escape COVID-19” serious game. We also would like to thank Monica Perez, Valérie Sauvan and Tomas Robalo Nunes from the Geneva University Hospitals Infection Prevention and Control department who were actively involved in the development of the serious game. Finally, we would like to extend our thanks to Audrey Morard and Jérôme Divorne from the Communication Department of the Geneva University Hospitals for their unfailing and most precious support.

Conflicts of Interest

None declared

Abbreviations

COVID-19	Coronavirus Disease 2019
IPC	Infection Prevention and Control

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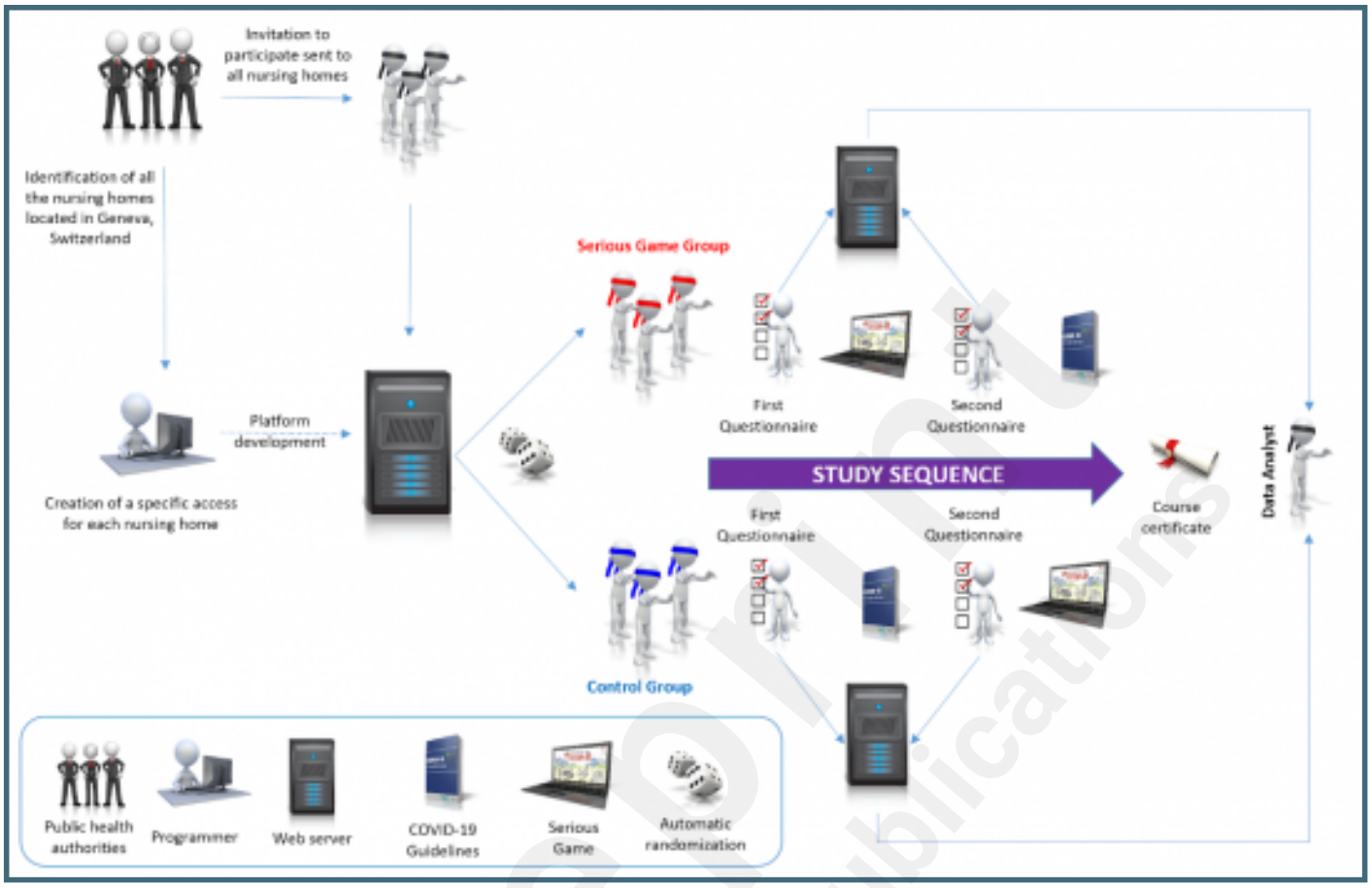
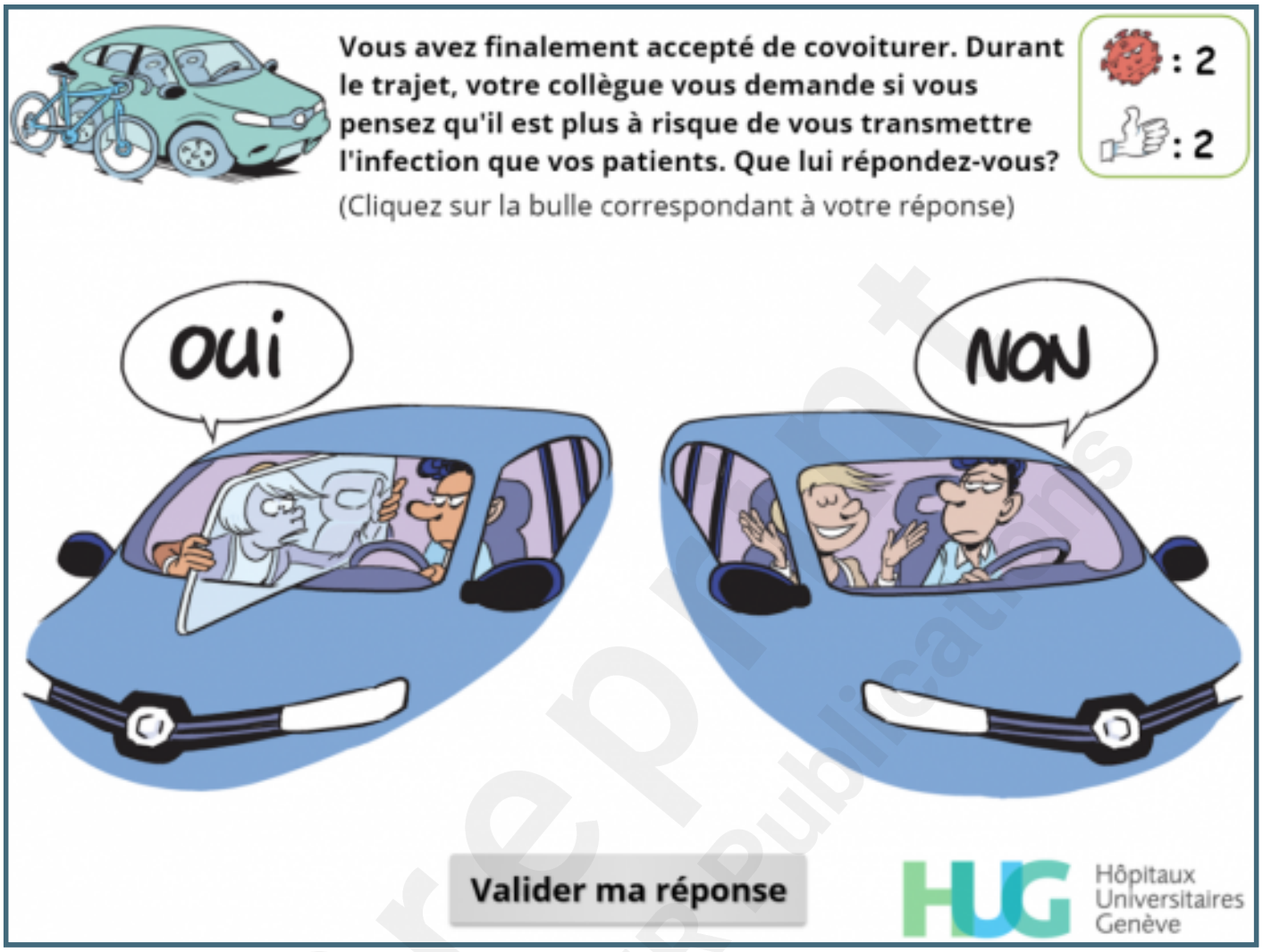
Supplementary Files

Figures

Study design and sequence.

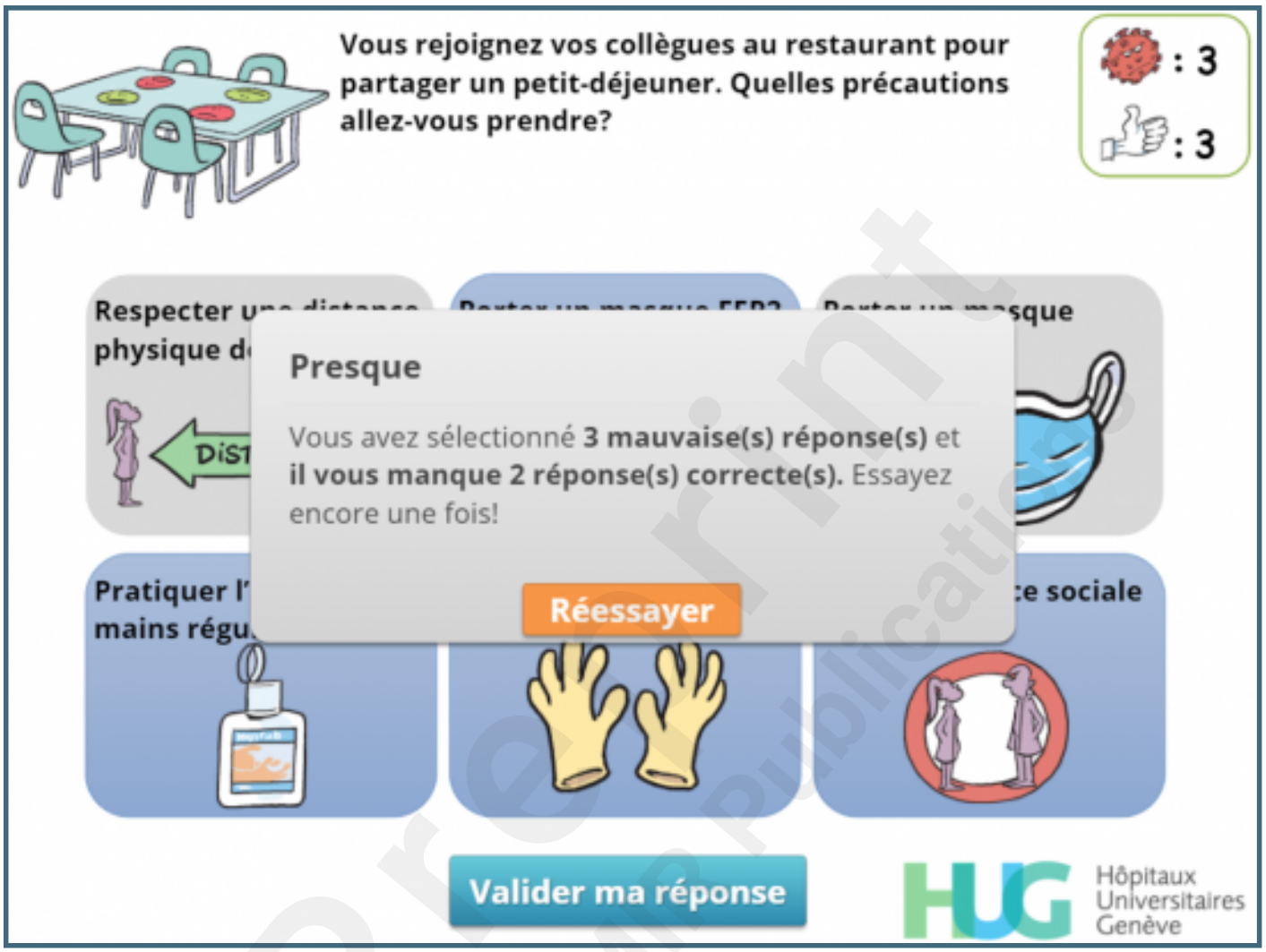


Simple choice interaction.

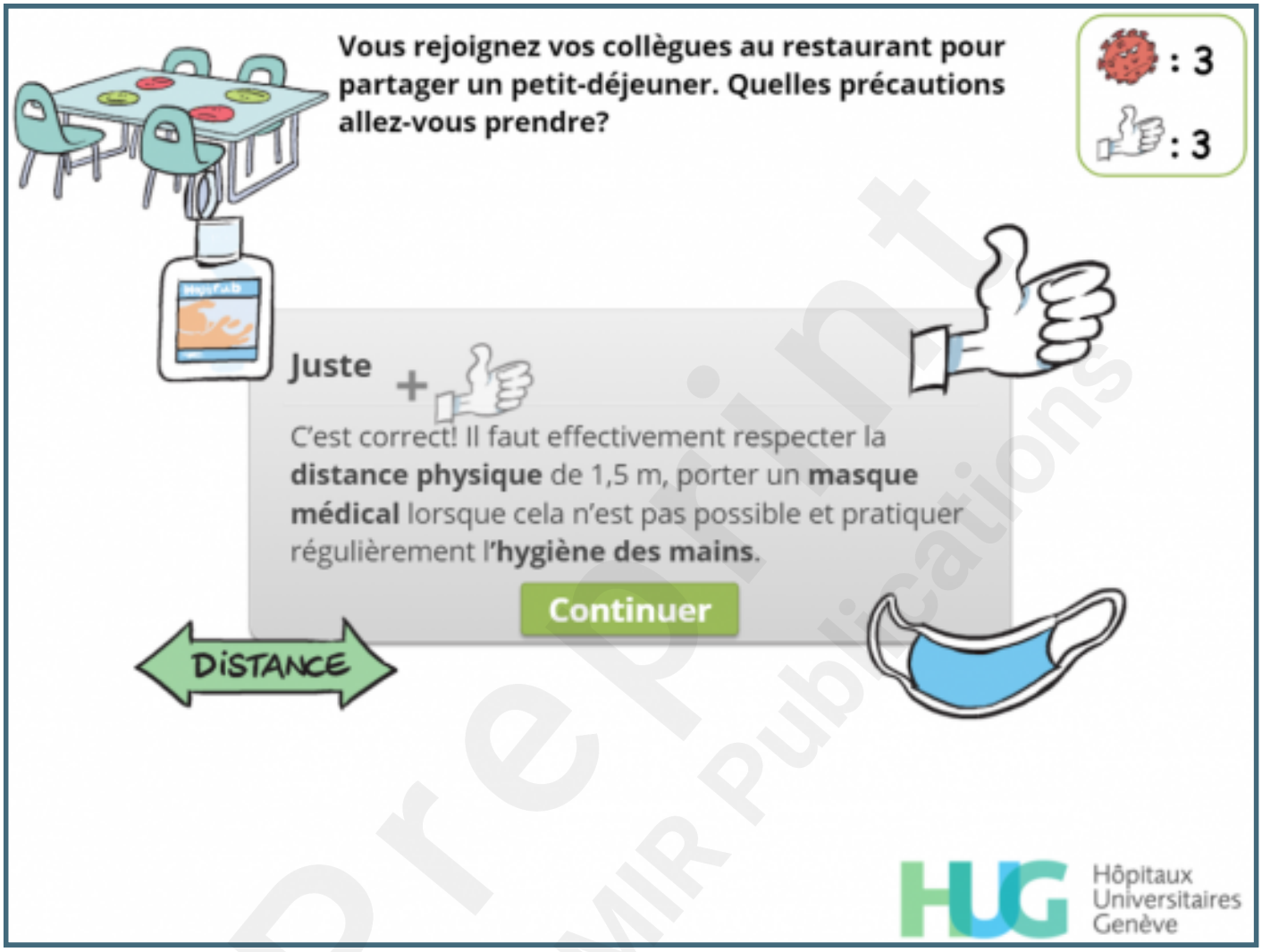


The player has to identify the precautions they should take when joining their colleagues for breakfast.

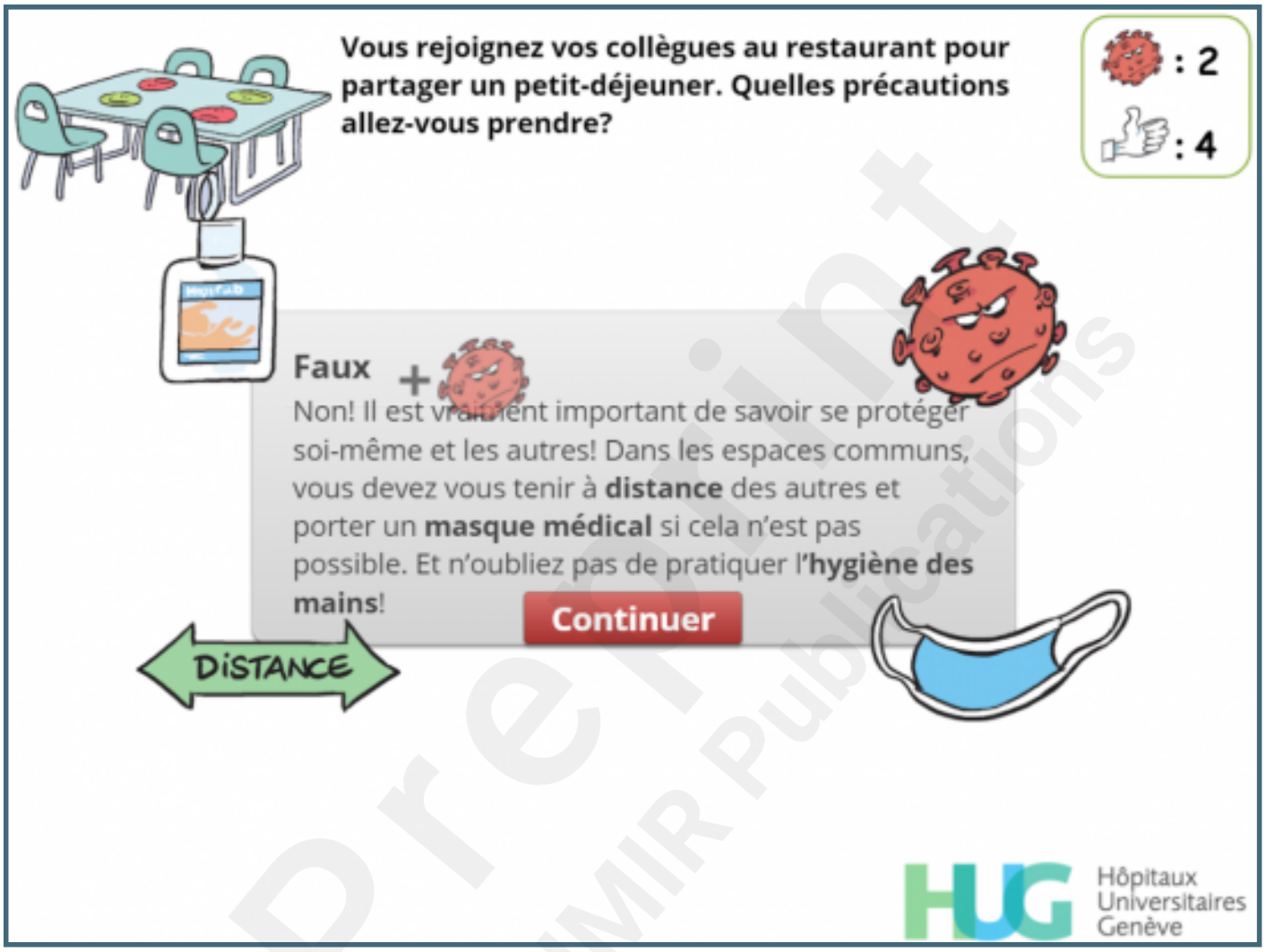
Feedback. The player has submitted a first answer and is informed that they have selected 3 wrong answers (“3 mauvaises réponses”) and that 2 correct answers are missing (“il vous manque 2 réponses correctes”). They can retry (“Réessayer”) once.



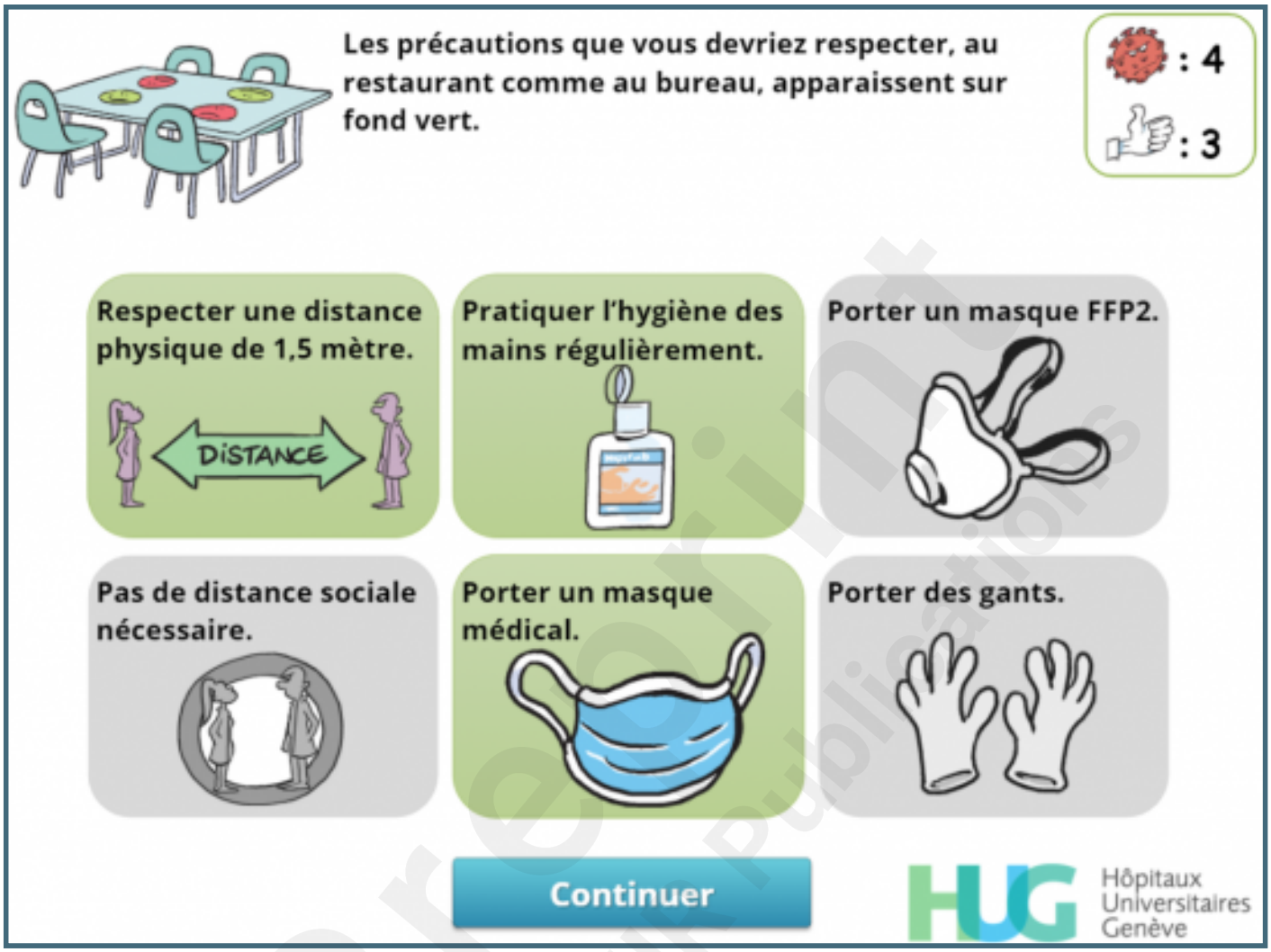
Feedback. The user has correctly answered the question. Visual hints related to the correct answers are displayed (mask, distance arrow, alcohol-based handrub) and a short text emphasizes the expected answers. A “thumbs up” image and a “plus” sign appear, rise, and progressively fade out before the thumbs-up count is updated.



Feedback. The player has retried but has failed to identify the correct answers. Visual hints related to the correct answers are displayed (mask, distance arrow, alcohol-based handrub) and a short text emphasizes the expected answers, which will be displayed when the player clicks on continue (“Continuer”). A virus and a “plus” sign appear, rise, and progressively fade out before the virus count is updated.



Feedback. When the user has failed to correctly answer the question, the correct answers are displayed over a green background.



Game over screen. The player has accumulated 5 viruses, and can either spend thumbs-up to decrease the virus count or restart the level.

Related publication(s) - for reviewers eyes onlies

Responses to reviewers' comments.
URL: https://asset.jmir.pub/assets/932709b6bb999641fcf04a58c5fe2d49.pdf