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USE OF TECHNOLOGY-ENHANCED SIMULATIONS FOR CYBER APTITUDE ASSESSMENT: PHASE II PROTOTYPE DEVELOPMENT

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Interim Report

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14. ABSTRACT
Work in cyber occupations can be quite demanding and necessitates individuals with certain aptitudes and traits to work competently. Selecting individuals to place into cyber occupations is the first step that needs to be undertaken. But what are the requisite aptitudes and traits of focus for the selection of these individuals and how should the assessment of those aptitudes and traits occur? The first chapter of our report describes a survey of individuals in cyber AFSCs to identify the order of those most important for successful work. Based on the survey, three aptitudes and three traits were determined to be the focus of subsequent selection assessment. The aptitudes are active learning, deductive reasoning, and systems thinking; with analytical thinking, adaptability, and situational awareness being the traits of interest. The second chapter describes a serious game developed to assess these six aptitudes and traits in candidates. A timeline, game flow, measures, help system, and system variables are described. Chapter three provides evidence for the construct validity of the measures in terms of factor analytic and item response theory (IRT) data. The fourth chapter provides a perspective of the game from a usability assessment.

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EXECUTIVE SUMMARY

Coovert et al. (2019) conducted a study to 1) identify aptitudes and traits required for success in select enlisted and officer United States Air Force (USAF) career fields using job analysis data from archival information and Subject Matter Experts (SME) ratings; 2) identify which cyber aptitudes and traits can be measured through existing Department of Defense (DoD) assessments; and 3) summarize relevant literature and recommendations for how serious games could be used to measure cyber aptitudes and traits.

Section 1.0 of the present project extended the previous work with the primary objective of developing a serious game to assess the suitability of military candidates for entry-level cyber career fields. For the purpose of this project, cyber career fields refers to the following Air Force Specialty Codes (AFSC); enlisted: 3D0X2 (Cyber Systems Operations), 1B4X1 (Cyber Warfare Operations), 1N4X1A (Digital Network Analyst), and 3D1X2 (Cyber Transport Systems); officer: 17DX/SX (Network Operations/Cyber Space Operations).

Using the results from the SME data collected, a list of critical aptitudes and traits were refined to include six (analytical thinking [AT], deductive reasoning [DR], systems thinking [ST], active learning [AL], adaptability (AD), and situational awareness [SA]) which become the focus and those to be assessed in a serious game as these six are expected to have a strong potential for demonstrating significant improvement in predictive validity/classification efficiency when used with existing DoD tests.

With the six aptitudes and traits identified, work began on the development of a serious game to assess those in individuals. The major components of the game are described in Section 2.0. Several ideas were developed and after input from a focus group, the development team settled on a serious game to manage a virus epidemic[1] as the game could be designed to elicit the aptitudes and traits of focus. Game design began and, along with extensive pilot work, a spiral development approach was taken to flesh out the overarching theme, sub-themes, and vignettes. Measurement of analytical thinking and active learning occur in a mini-game set in a selection context. A second mini-game, whereby the candidate repairs a damaged circuit board, was used to measure DR. The final three constructs, ST, AD, and SA, were measured throughout active game play where treatment centers were monitored, vehicles loaded and dispatched, and adjustments made to demands made by changing environmental conditions.

Construct validation of the indicators used to reflect the six constructs is described in Section 3.0. In addition to face validity, we relied extensively on factor analysis and item response theory (IRT) to select the final items from large initial pools. The sample of individuals involved in pilot work closely mirrored the population of those new or early in their USAF career. The final items have good reliability and discriminability.

The usability of the serious game is described in Section 4.0. Throughout development, the usability of each module was assessed and adjustment made when necessary. Two larger usability assessments were made as well. One following the development of the selection mini-game and a second of the full game. One must keep in mind this is a serious game and was developed as an assessment tool. It is not a typical online game which is developed primarily for

[1] This decision was made, and game development began approximately one year prior to the identification of COVID-19 in China and the resulting world-wide pandemic.

entertainment. Thus, the obtained ratings from players for training to play the game, the help feature, and overall aspects of the game are quite reasonable.

As originally envisioned, this project would also sample individuals in Basic Military Training (BMT) at Lackland AFB, TX. Scores on the Virus Slayer serious game were to have been correlated with scores on the Armed Services Vocational Aptitude Battery (ASVAB) and perhaps other scores available from Military Entrance Processing Station (MEPS). Due to social distancing constraints resulting from the Corona Virus 19 (COVID-19) pandemic, this testing has been delayed. To continue the validity assessment of the Virus Slayer serious game, this testing should be completed as soon as is reasonable. Furthermore, testing of individuals at the cyber training schoolhouse (e.g., Keesler AFB, MS) or other appropriate locations should be performed to assess the incremental and predictive validity of the serious game as part of an overall selection and placement system for cyber AFSCs.

1.0 SURVEY TO IDENTIFY RELATIVE IMPORTANCE OF APTITUDES AND TRAITS

1.1 Overview

A mission of the Air Force Research Laboratory (AFRL) Airman Systems Directorate is "to advance human performance in air, space and cyberspace through research, education and consultation" (AFRL, 2018). In support of this mission for AFRL, this project focused on the use of technology-enhanced assessments for the measurement of aptitudes and traits important for performance in cyber careers in the USAF.

Phase I of this research effort focused on 1) identifying aptitudes and traits required for success in select enlisted and officer USAF career fields using job analysis data from archival information and SME ratings; 2) identifying which cyber aptitudes and traits can be measured through existing DoD assessments; and 3) summarizing relevant literature and recommendations for how serious games could be used to measure cyber aptitudes and traits (Coovert, Martin, Howard, Kim, Dreibelbid, Arbogast, & Potter, 2019).

The Phase II effort extendeds on the previous Phase I effort, with the primary objective of developing a serious game to assess the suitability of military candidates for entry-level cyber career fields. For the purpose of this project, cyber career fields refers to the following AFSCs; enlisted: 3D0X2 (Cyber Systems Operations), 1B4X1 (Cyber Warfare Operations), 1N4X1A (Digital Network Analyst) and 3D1X2 (Cyber Transport Systems); officer: 17DX/SX (Network Operations/Cyber Space Operations).

The focus of the game was to assess both traits and aptitudes that were found important to cyber occupations in Phase I work but not adequately covered by current DoD selection tests. Phase I determined the following five traits and four aptitudes held the most promise:

1.1.1 Traits

- **AT**- The degree to which individuals analyze information and use logic to address work-related issues and problems.
- **AD** - The degree to which individuals are open to change (positive or negative) and to considerable variety in the workplace.
- **Dependability** - The degree to which individuals are reliable, responsible, and dependable, and fulfill obligations.
- **Persistence** – The degree to which individuals have persistence in the face of obstacles.
- **SA** – The degree to which individuals pay attention to their surroundings and rarely get lost or surprised.

1.1.2 Aptitudes

- **AL** - The ability to understand the implications of new information for both current and future problem-solving and decision-making.
- **Decision Making** - The ability to consider the relative costs and benefits of potential actions to choose the most appropriate one.
- **DR -** The ability to apply general rules to specific problems to produce answers that make sense.

- **ST** - The ability to understand how multiple parts of a system interact and influence each other.

The first objective of the Phase II effort was to identify targeted aptitudes and traits to assess in a serious game. Using the critical cyber aptitudes and traits identified in Phase I as a starting point, we collected SME data to further refine them. The SME ratings data collection is described in detail in the next section.

1.2 SME Survey

A survey was developed to seek input from those in cyber career fields on the traits and aptitudes listed above and their importance for training, on-the-job performance, and incremental benefit (see Appendix A for the full list of survey questions). Career Field Managers (CFM) for the above AFSCs were provided: 1) a roster of 200 potential respondents for the survey (200 emails for each 1N4X1A, 3D1X2, and 17DX/SX), 2) an email draft and survey link to send to the potential respondents inviting them to complete the survey, and 3) a follow up email to be sent approximately two weeks later requesting the survey be completed (see Appendix B for the email template used for the cyber CFMs).

The survey asked respondents to rank-order traits or aptitudes by importance for three different purposes: 1) the expected incremental benefit provided when measures of the construct are used with existing DoD tests for the selection of cyber operators, 2) the importance of the construct to on-the-job performance, and 3) the importance of the construct to performance in training. Below are summary tables representing the responses received through 22 April 2019. It is important to note the numbers are meaningful within construct type (trait vs. aptitude) as there are five traits to rank-order and only four aptitudes. That is, the range of possible values is different for the traits (1-5) and the aptitudes (1-4).

Between distribution of the survey links on 21 February 2019 and 22 April 2019, 306 respondents from the distribution lists clicked on the link, with 290 completing at least one item on the survey. The results are summarized below.

Rank ordering of importance to: training (1 = average; 3 = high; 5 = extreme) and on-the-job performance (1 = average; 3 = high; 5 = extreme) as well as incremental benefit (1 = least; 5 = highest). Note: number in parentheses indicated within-purpose rank order of importance (1=most important; 5=least important).

Table 1. Rankings Made within Construct Type (1-5 traits)

Trait	Incremental Benefit (*N* = 275)	On-the-Job (*N* = 285)	Training (*N* = 290)	Average Rank Order across the Three Purposes
Analytical Thinking	4.00 (1)	3.63 (1)	3.88 (1)	3.84 (1)
Adaptability	3.07 (2)	3.19 (2)	3.10 (2)	3.11 (2)
Situational Awareness	2.98 (3)	2.95 (3)	2.68 (4)	2.87 (3.33)
Persistence	2.65 (4)	2.63 (5)	2.92 (3)	2.74 (4)
Dependability	2.30 (5)	2.60 (4)	2.41 (5)	2.44 (4.67)

Rank ordering of importance to: training (1=average; 4=extreme) and on-the-job performance (1=average; 4=extreme) as well as incremental benefit (1= least; 4 = highest). Note: number in parentheses indicated within-purpose rank order of importance (1 = most important; 4 = least important).

Table 2. Rankings Made within Construct Type (1-4 aptitudes)

Aptitude	Incremental Benefit (*N* = 277)	On-the-Job (*N* = 282)	Training (*N* = 291)	Average Rank Order across the Three Purposes
Systems Thinking	2.72 (1)	2.61 (1)	2.59 (2)	2.65 (1.33)
Deductive Reasoning	2.69 (2)	2.60 (2)	2.51 (3)	2.60 (2.33)
Active Learning	2.39 (3)	2.28 (4)	2.99 (1)	2.56 (2.67)
Decision Making	2.21 (4)	2.50 (3)	1.91 (4)	2.20 (3.67)

1.2.1 Within-Construct and Across Purposes

Traits. Examination of Table 1 reveals consistency in the top two traits across the three purposes, with AT and AD rated numbers one and two, respectively. Situational awareness was rated third for two purposes and fourth for the third, giving it an average rating of 3.33 making it the third most important trait. Persistence and dependability receive averages of 4.00 and 4.67 across purpose ratings making them the fourth and fifth most important traits, respectively.

Aptitudes. Table 2 presents the ratings across purposes and the average for the aptitudes. The incremental benefit rank-order is the same as the average across purpose (highest to lowest) for systems thinking, deductive reasoning, active learning, and decision making.

1.2.2 Global Rating Ignoring Trait/Aptitude Distinction

We asked the SMEs to make one rating where they ignored the distinction of trait versus aptitude and the distinction between the different purposes (i.e., incremental benefit, training, and on-the-job performance). These ratings are provided in Table 3.

Overall rank-ordering ratings were made ignoring distinction of trait or aptitude (e.g., against all 9 where 1=least important and 9=most important)

Table 3. Global Rank Orderings

Construct	Construct Type T = Trait, A = Aptitude	Global Rating comparing each construct to all others ignoring aptitude/trait distinction. Higher number indicates greater importance (*N* = 288)
Analytical Thinking	T	6.23
Deductive Reasoning	A	5.37
Active Learning	A	5.26
Systems Thinking	A	5.26
Adaptability	T	5.16
Decision Making	A	4.74
Situational Awareness	T	4.52
Persistence	T	4.41
Dependability	T	4.06

Examination of Table 3 reveals a trait (AT) was rated highest, followed by three aptitudes (DR, AL, and systems thinking). These aptitudes are essentially interchangeable given the closeness of their ratings. Next comes a trait (AD), another aptitude (decision making), and finally three traits (SA, persistence and dependability).

From the statement of work we have the following "Due to the wide range of reliable aptitude measures available in existing DoD tests and generally high inter-correlations among aptitude tests (e.g., Ree & Earles, 1991), it is expected that trait measures (e.g., AD, dependability, persistence, situational awareness) reliably assessed through serious games will explain more unique variance than aptitude measures. Therefore, to the extent possible and practical, traits should be given preference over aptitudes in selection of the constructs represented."

Given this, and the data we have to date, we recommend the following grouping of traits and aptitudes in groups of three to correspond to the statement of work's levels of effort.

Table 4. Proposed Grouping given Data to Date

Construct	Construct Type T = Trait, A = Aptitude. Number in () is the within construct rank order from Tables 1 and 2.	Global Rating comparing each construct to all others ignoring aptitude/trait distinction. Higher number indicates greater importance (*N* = 286)
Level 1		
Analytical Thinking	T (1)	6.22
Deductive Reasoning	A (2)	5.38
Systems Thinking	A (1)	5.26
Level 2		
Active Learning	A (3)	5.26
Adaptability	T (2)	5.15
Situational Awareness	T (3)	4.52
Level 3		
Decision Making	A (4)	4.73
Persistence	T (4)	4.40
Dependability	T (5)	4.08

Examination of this table indicates it may make the most sense to design the serious game as a level 2 effort measuring a combined six aptitudes and traits. The current proposed order keeps the rank orders from Tables 1 and 2 and makes a minor switch to Table 3 by moving the trait situational awareness above the aptitude decision making. This is done to have three traits and three aptitudes measured by the assessment game.

1.3 Summary

Using the results from the SME data collected the list of critical aptitudes and traits were refined to analytical thinking, deductive reasoning, systems thinking, active learning, AD, and situational awareness. In Phase I, these aptitudes and traits were determined to not be adequately measured by current DoD tests (e.g., ASVAB, Tailored Adaptive Personality Assessment System [TAPAS], Cyber Test, Air Force Officer Qualifying Test [AFOQT], Self-Description Inventory [SDI-O], Electronic Data Processing Test [EDPT]). Combined with the evidence provided by the incremental validity SME ratings summarized above, these six aptitudes and traits are expected to have a strong potential for demonstrating significant improvement in predictive validity/classification efficiency when used with existing DoD tests. Additional studies are needed to examine the psychometric properties (i.e., reliability, validity, norms) of the cyber game for USAF enlisted and officer personnel.

2.0 GAME FLOW DESCRIPTION FOR THE VIRUS SLAYER SERIOUS GAME

2.1 Overview

The present chapter provides an overview of the virus slayer serious game developed to assess aptitudes and traits related to performance in cyber occupations. The focus is on the game itself to provide the reader a high-level understanding of what happens in the game and at what time.

2.2 Game Flow of the Virus Slayer Serious Game

The Virus Slayer serious game is designed to provide an engaging and challenging assessment. Its purpose is to assess the aptitudes and traits identified in the first part of this work. The following steps the reader through the major components of the game from the player's perspective.

2.2.1 Game Segment 1: Orientation and Introduction

Approximate Time: 0–30 seconds

The individual to be assessed is seated in front of a computer with the Virus Slayer serious game launched. The candidate sees the screen depicted in Figure 1 and is prompted to enter their unique identification number and click the submit button.

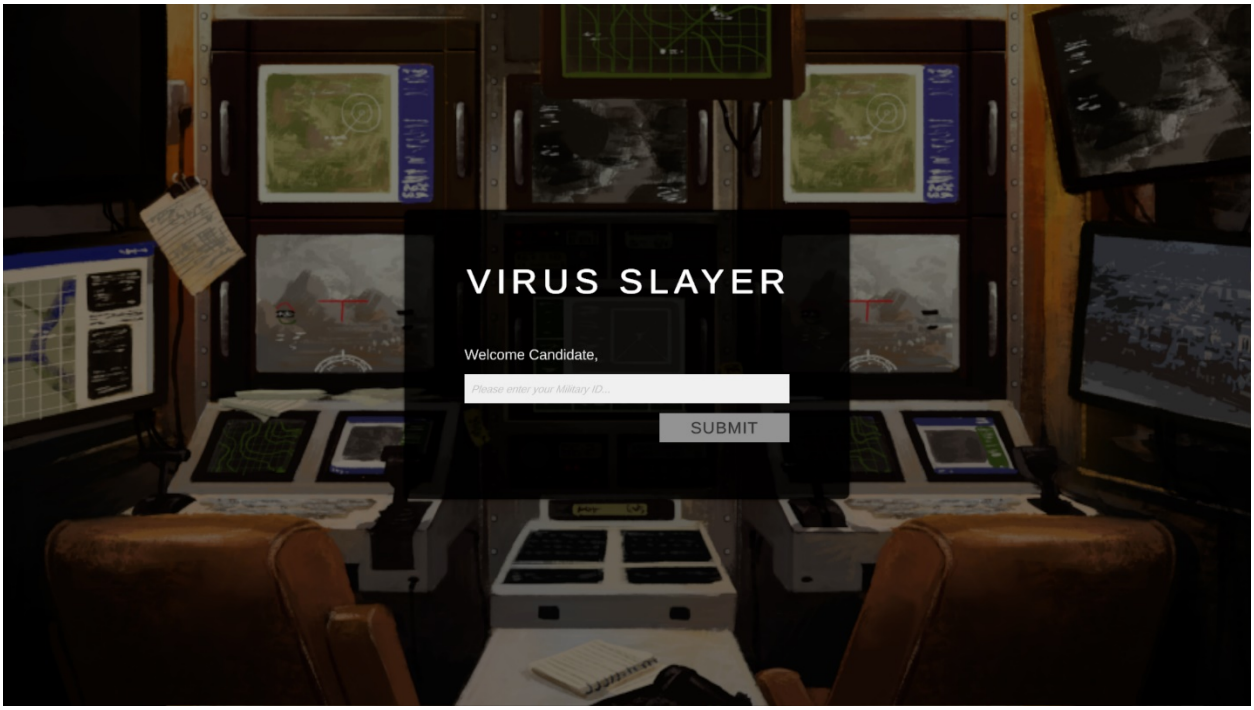


Figure 1. Initial Screen Presented to Candidate.

An introductory screen is displayed, see Figure 2. The purpose is to provide a high-level overview of the game and the player's role and goals. As can be seen in the figure, the game context is one where a virus has infected the population and unless decisive action is taken a pandemic resulting in great loss of life will ensue. The goal of the player is to minimize loss of life by supplying the hospitals and clinics sufficient supplies (i.e., antiviral agents, water, food)

in a timely fashion to treat patients before the disease evolves through three phases ultimately resulting in a patient's death.

The player is instructed to utilize a drone to move about the city and probe each treatment center in order to determine its capacity (50, 175, 250 beds), current state (normal, degrading, critical), and level of each supply (antiviral, water, food). Players are informed supply consumption is influenced by treatment center capacity (e.g., 250 patient capacity consumes fastest, and 175 capacity consumes faster than 50 patient capacity). Supplies can be delivered using two modes of transport: trucks or helicopters. Each mode of transport is impacted by inclement weather and the loaded capacity of transports should be decreased during inclement weather to decrease the likelihood of crashes.

Finally, players are informed the longer the game proceeds the greater the likelihood the virus will mutate, necessitating an increase in the amount of supplies required to treat patients.

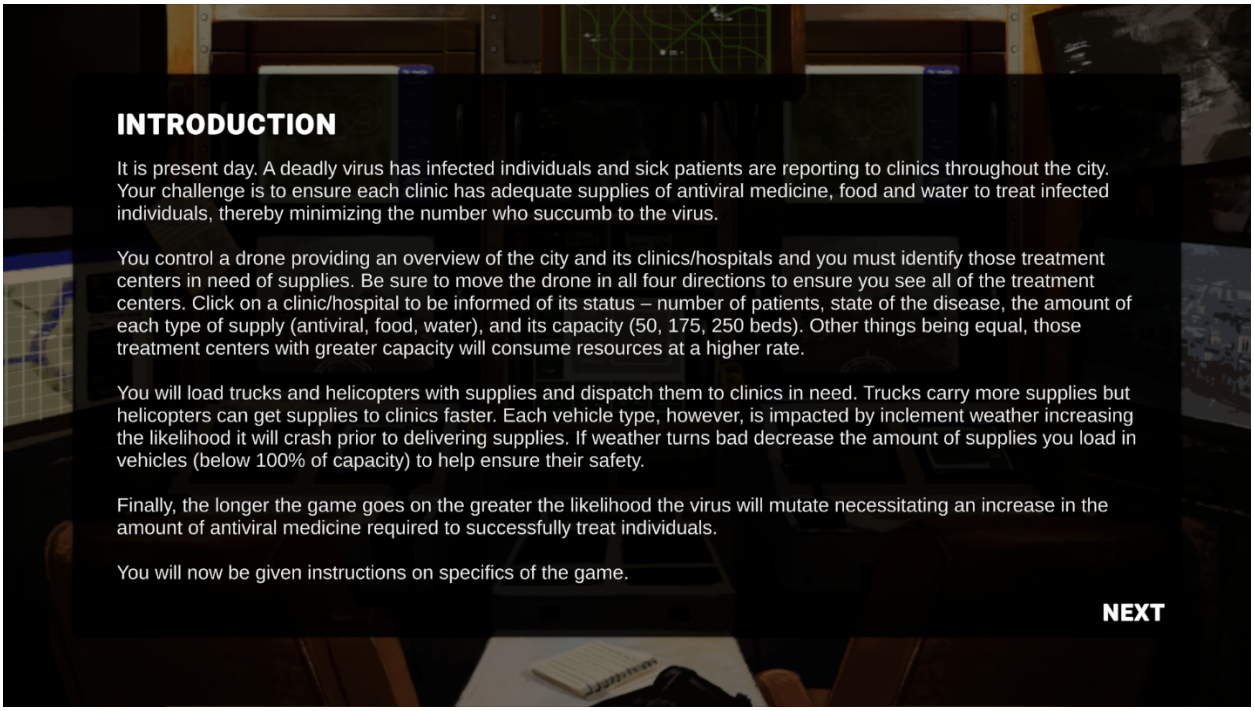


Figure 2. Introductory Screen Introducing the Game to the Player.

Once the game has been introduced and the high-level overview provided, the game continues as follows.

2.2.2 Game Segment 2-Selection Mini-game

Purpose: Establish context for the game and set up administration of the items for construct assessment.

Context: Avatar in a military uniform sits behind a table with hands folded on the table. In Figure 3, an American flag is visible in the background. The avatar says the following sternly and with a sense of urgency:

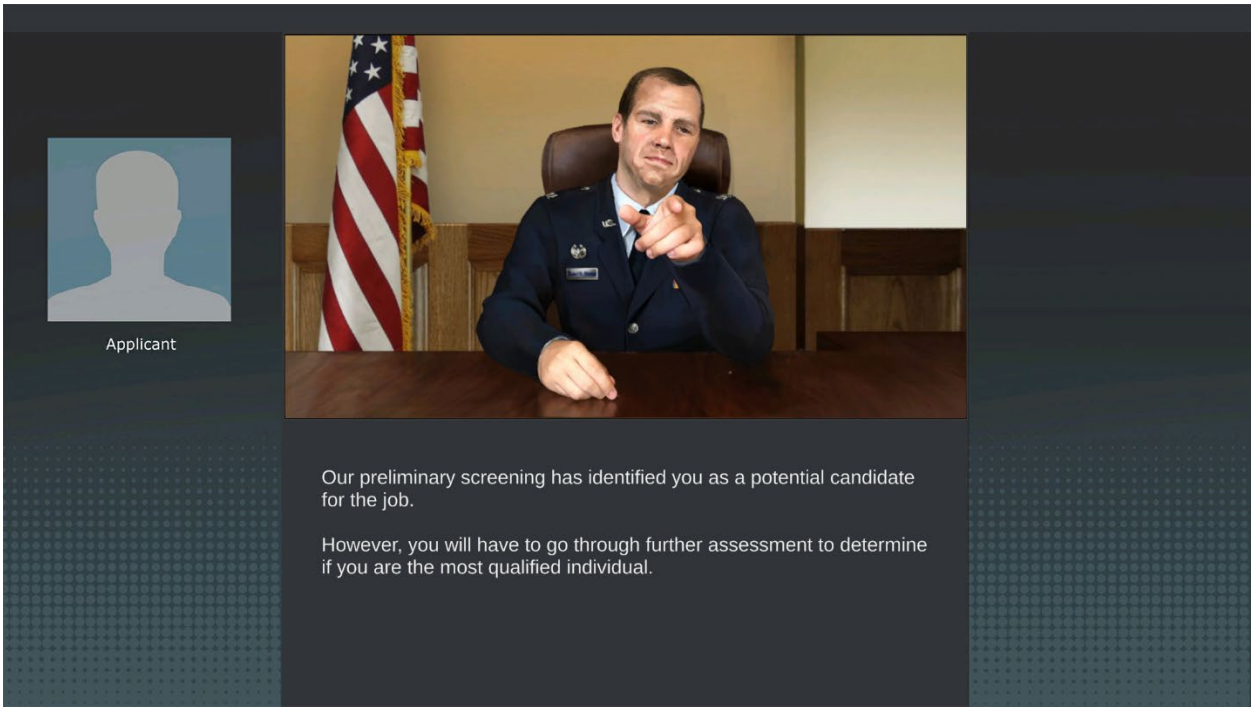


Figure 3. Avatar Introducing the Candidate to the Assessment.

Approximate Time: 31 seconds to 1 minute 30 seconds into the game.

Avatar. "Greetings. I am Colonel Martin, aide to the General.

We are living in unprecedented times. A large virus outbreak has occurred, and we must take action immediately to deal with this crisis or thousands will die. The General has tasked me with identifying a suitable individual for managing our response to the outbreak. That is why you are here.

Our preliminary screening has identified you as a potential candidate for the job. However, you will have to go through further assessment to determine if you are the most qualified individual. For this job, you need the ability to understand viruses and also how to efficiently get resources delivered to hospitals and clinics. As such, we will ask you to respond to questions dealing with viruses and then logistics. Here are the virus questions; it is vitally important to do your best in answering these questions."

Approximate Time: 1 minute 31 seconds to 8 minutes 30 seconds.

A seven-minute countdown timer starts on the lower left of the screen.

Virus domain analytical thinking questions are administered one at a time. Upon completion of the virus items the logistic analytical thinking items are administered.

Candidate: Responds to each of the 13 AT multiple-choice items. See Section 3.0 for the AT items.

Construct Assessed: AL

Approximate Time: 8 minutes 31 seconds to 9 minutes into the game.

Context: The candidate is notified they will be directing the response to the virus outbreak and a *learning style* assessment will be made for use with future applicants.

Avatar: "Congratulations, you've passed the assessments. As our most qualified candidate, you will be directing our response to this emergency.

Prior to beginning, however, we need to ask you some additional questions that are associated with how you learn. These will help us when selecting other individuals to manage future outbreaks. Don't worry, there are no right or wrong answers, so it is vitally important you are honest when responding.

Please rate the extent to which you agree or disagree with each of the following statements."

Approximate Time: 9 minutes to 9 minutes 30 seconds into the game.

Candidate: The eight AL items are responded to by the candidate. See Section 3.0 for the set of AL items.

2.2.3 Game Segment 3: Training

Approximate Time: 9 minutes 31 seconds to 13 minutes 30 seconds into the game.

Context: Introduce training in core game loop play and set the context for the game becoming more difficult in Phases 2 and 3 through the introduction of inclement weather (increases the likelihood a vehicle crashes resulting in non-delivery of supplies) and the virus mutating (requiring an increase in antiviral dosing to effectively treat the patient).

Avatar: "Thank you for your answers. You will now be given training in how to perform the job. Once training is complete, you will immediately begin to battle the virus outbreak. A couple of warnings. Firstly, the weather is expected to turn and become hazardous to both ground and air vehicles. Secondly, preliminary indications are that this is a strain of virus that can be expected to mutate.

Good luck!"

The first slide in the training module as seen in Figure 4, presents the Mission Overview.

Figure 4. Mission Overview Introduction

Figure 4 presents a portion of the world in which the player must operate, and players are instructed they will use a drone to move about in this world. See top panel of Figure 4. The middle panel of the mission overview slide introduces the clinic interface window. Specific information of the selected treatment center is provided, and the candidate is instructed to utilize that information to determine which treatment centers are most in need of resources. The lower panel of the figure informs the player that two different transport units (trucks, helicopters) are available for moving resources to the treatment centers.

After the player finished the Mission Overview slide, they are introduced to two different options of keys that control the drone. The camera on the drone can pan the four cardinal directions (North, South, East, and West corresponding to left, right, up, and down). In Figure 5, the mouse is utilized to zoom in and out and to select/interact with treatment centers.

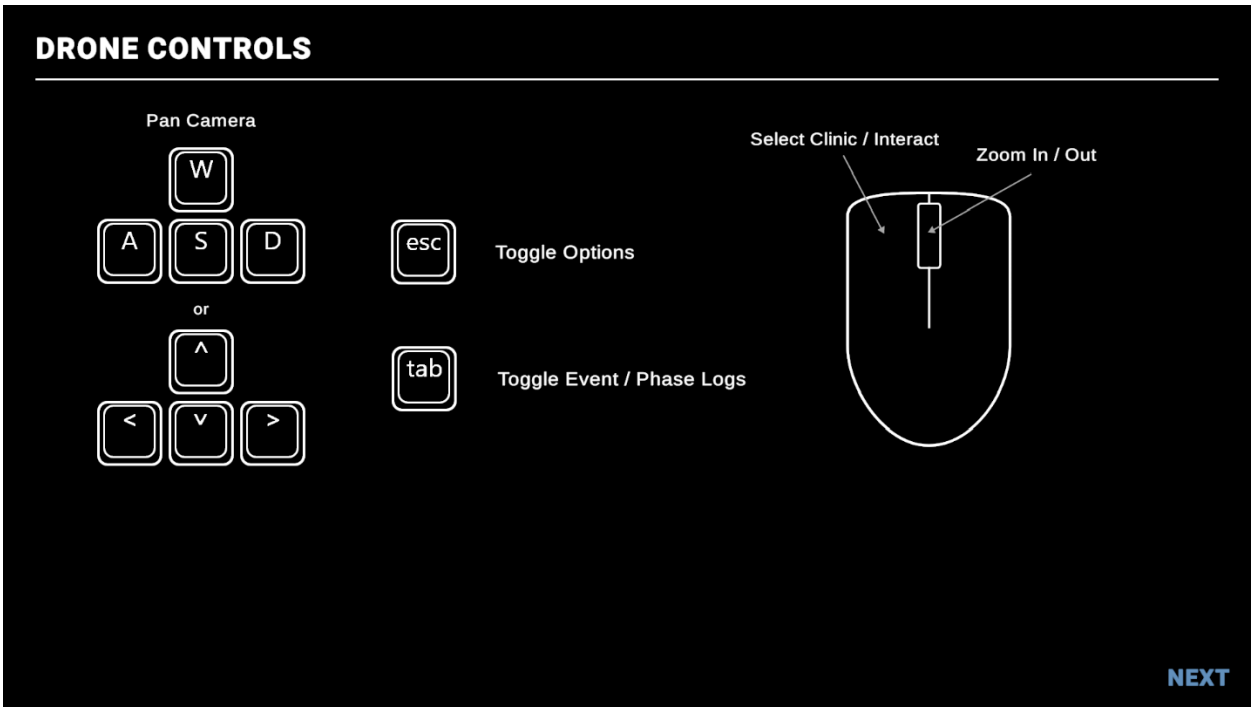


Figure 5. Drone Control Instructions.

2.2.4 Game Segment 4: Competency Demonstration

The main elements of the game are introduced so the player must now demonstrate mastery of the controls and an understanding of where information is found in various display windows. In Figure 6, the first competency demonstration has the player cycle through the Drone Control Keys by having them pan the camera left, right, up, and down.

Figure 6. Demonstration of Drone Control Competency.

The player must perform those four actions before the game will continue. Once the camera is panned in the four directions the next competency assessment is presented. In Figure 7, the candidate must zoom the camera in and out.

Figure 7. Demonstration of Camera Zoom Competency.

Next, the candidates must demonstrate they understand how to select treatment centers. In Figure 8, they must select two separate centers.

Figure 8. Demonstration of Competency for Selecting Clinics.

If the treatment centers are not selected in a reasonable amount of time, the candidate is cued to click on them using a red box to highlight the designated treatment center as shown in Figure 8. This process of using a red box to cue the player to the correct response is used throughout the remainder of training if they have not made the correct response within a reasonable amount of time.

Competency assessment continues by having the player sequentially select the three separate areas of the window displaying specific information for the selected treatment center. The first has the individual select the area corresponding to the treatment center name, current operational status, and capacity. See Figure 9.

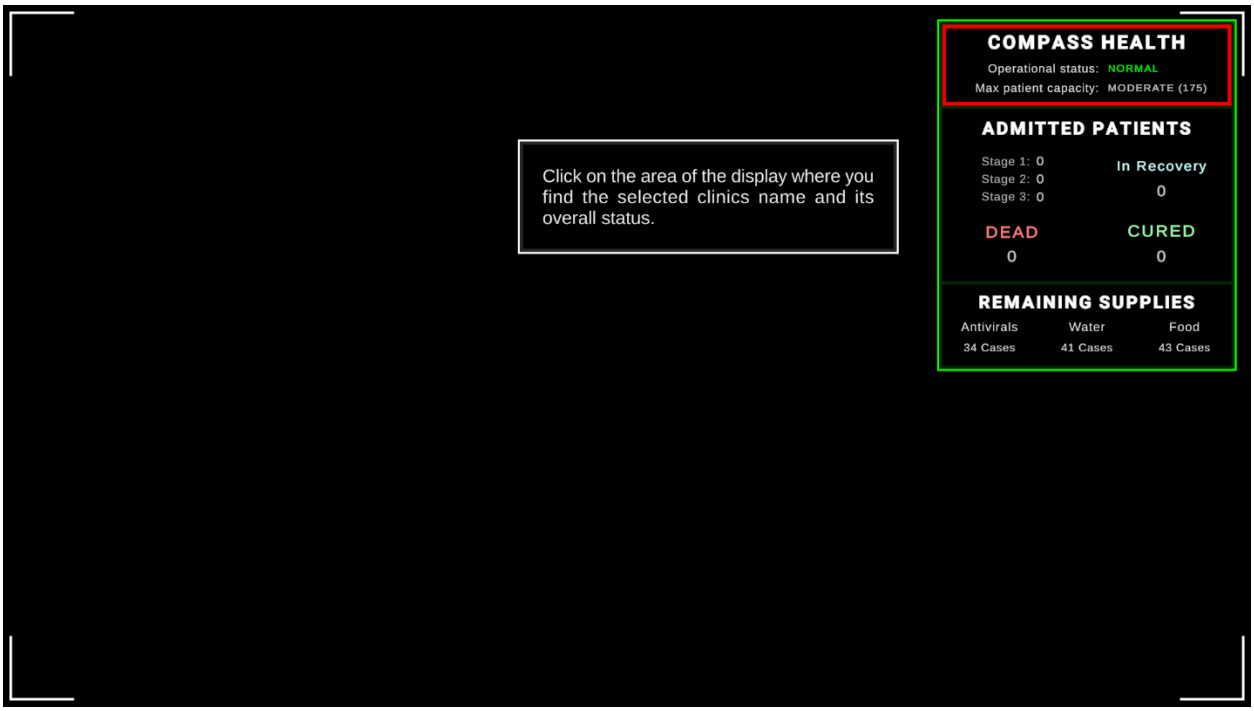


Figure 9. Competency Assessment for Identifying Treatment Center Name, Operational Status, and Capacity.

Next comes the identification of specific cases within the selected treatment center. In Figure 10, it shows this window provides information on the number of patients categorized by each of the three disease states, the number in recovery, the number cured, and the number dead.

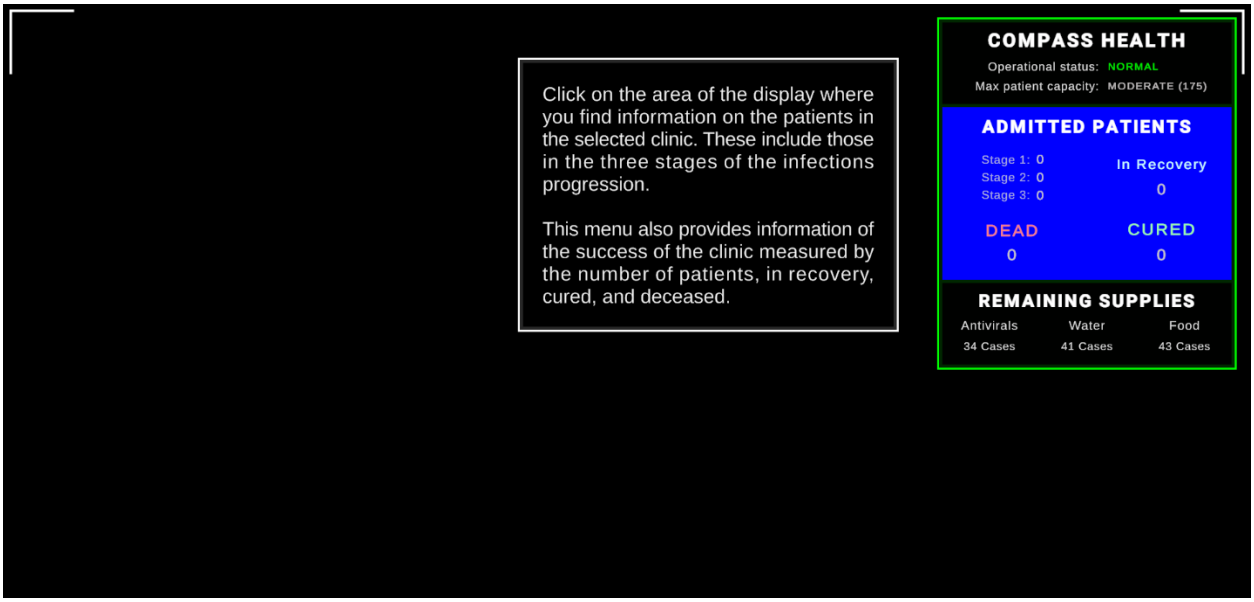


Figure 10. Competency Assessment for Identifying where Specific Information on Patient Categories are Found.

The third pane of the window informs the player of the amount of each type of supply remaining at the clinic. This information is critical for the player to determine how much of each supply unit should be sent and how quickly it should arrive (implications for truck versus helicopter). See Figure 11 for this information.

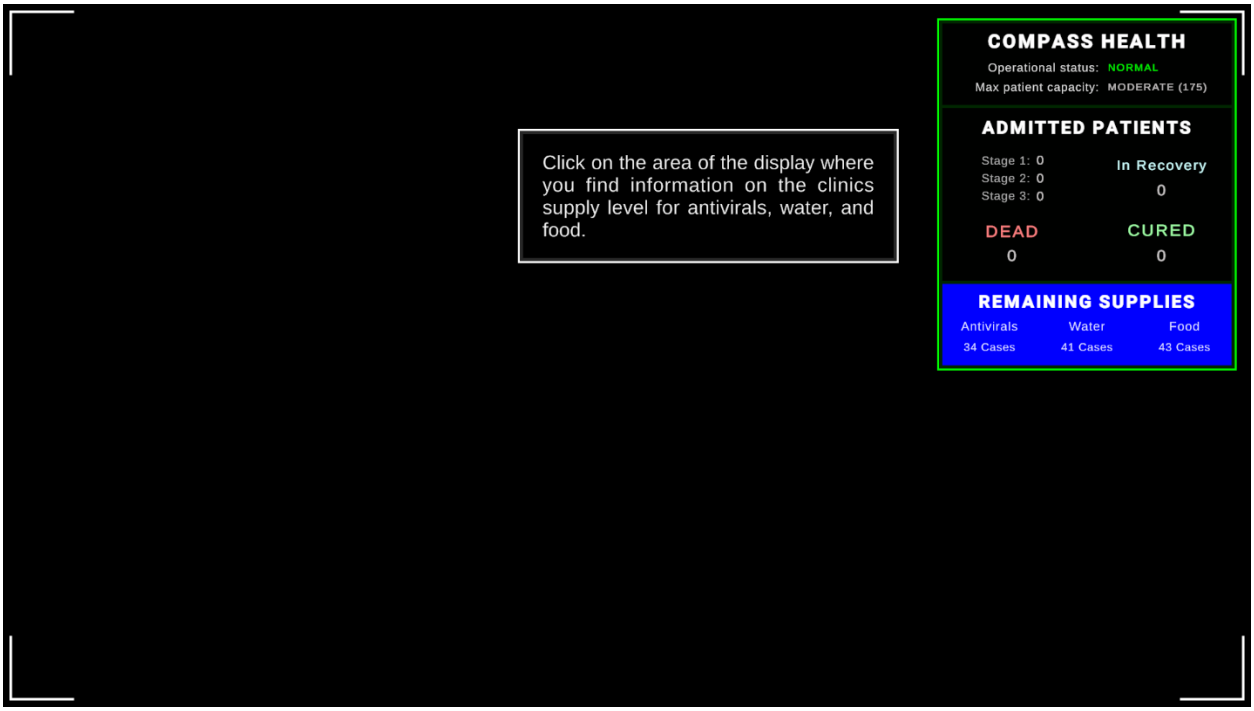


Figure 11. Competency Assessment for Identifying the Pane in the Window Informing of Supply Levels.

The next area in which the player is to demonstrate competency in the selection of transport units, loading, and dispatching. The first competency in this area is the loading of various amounts of supplies onto a truck as shown in Figure 12. This competency has the truck already selected and the player must load ten units of antivirals, 15 units of water and five units of food. This is intended to solidify to the player that different amounts of each supply can be loaded onto a transport, and the transport need not be fully loaded to be dispatched. Once the 30 units are loaded, the player demonstrates competency in dispatching via clicking on the Confirm Unit Dispatch button.

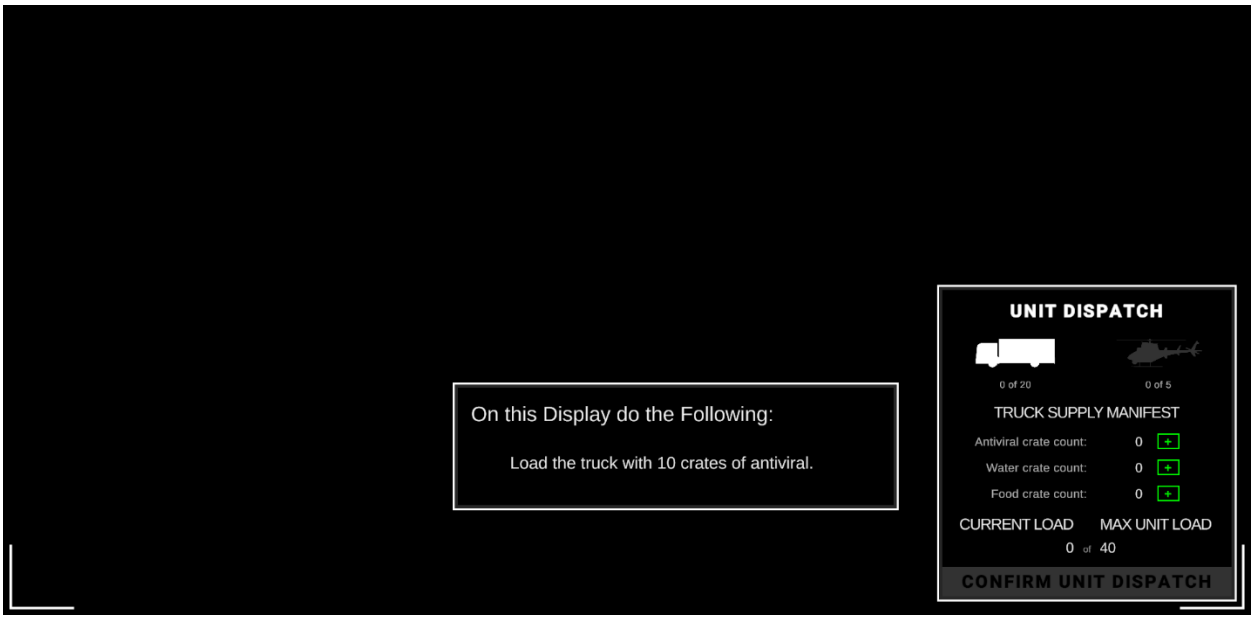


Figure 12. Demonstrating Competency in Loading and Dispatching a Truck.

Following the successful loading and dispatching of the truck, the player demonstrates competency in selecting a transport unit by clicking the helicopter icon. Once selected, the player follows instructions to load it with various levels of supplies. See Figure 13. Once loaded correctly, the player is instructed to dispatch the unit.

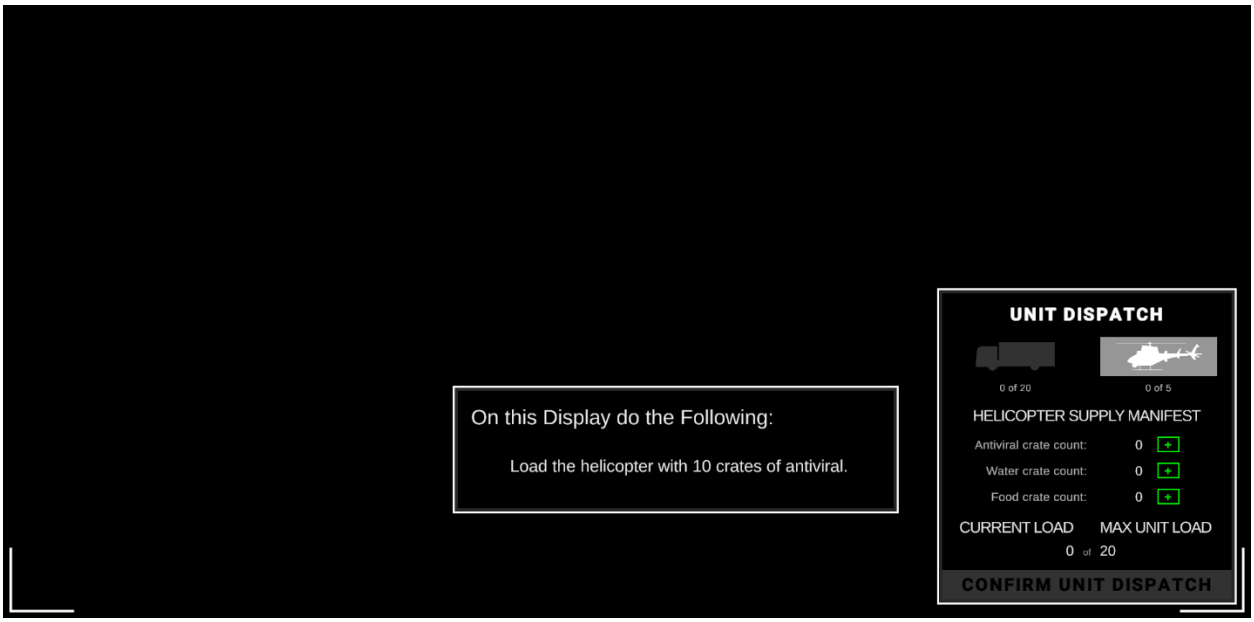


Figure 13. Selection of the Helicopter, Loading and Subsequent Dispatching.

Competency assessment now moves to overall situational awareness of population level statistics, status of the combined treatment units, and the weather and phase of the game. As shown in Figure 14, the first competency assessed here has the player click on the pane of the window containing population level summary information.

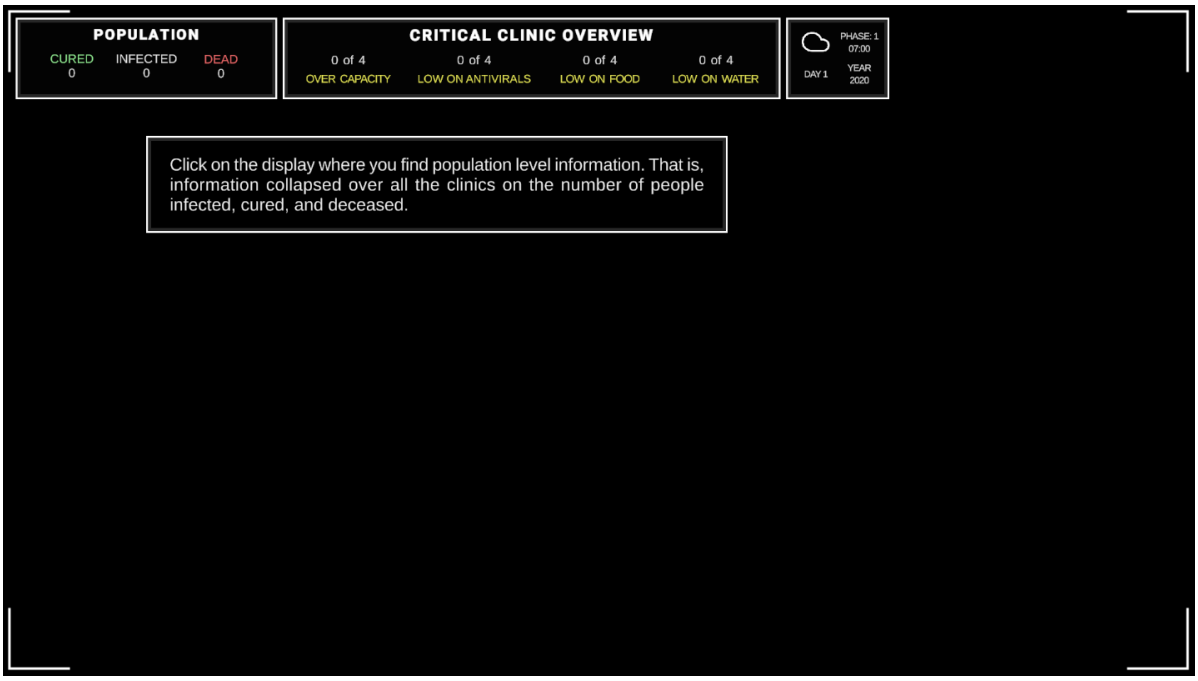


Figure 14. Competency Demonstration of Understanding where to Obtain Population Level Information.

Next, the player is asked to indicate where information is provided regarding the overall status of all provider centers. This pane of the window provides information on the number of treatment centers over capacity, and the number short on each of the three supplies necessary to treat the virus as shown in Figure 15.

Figure 15. Competency Demonstration of where to Obtain Summary Information on the Status of all the Treatment Centers

The last competency assessment for this display is to demonstrate where to find information on the phase of game play and environmental conditions. See Figure 16.

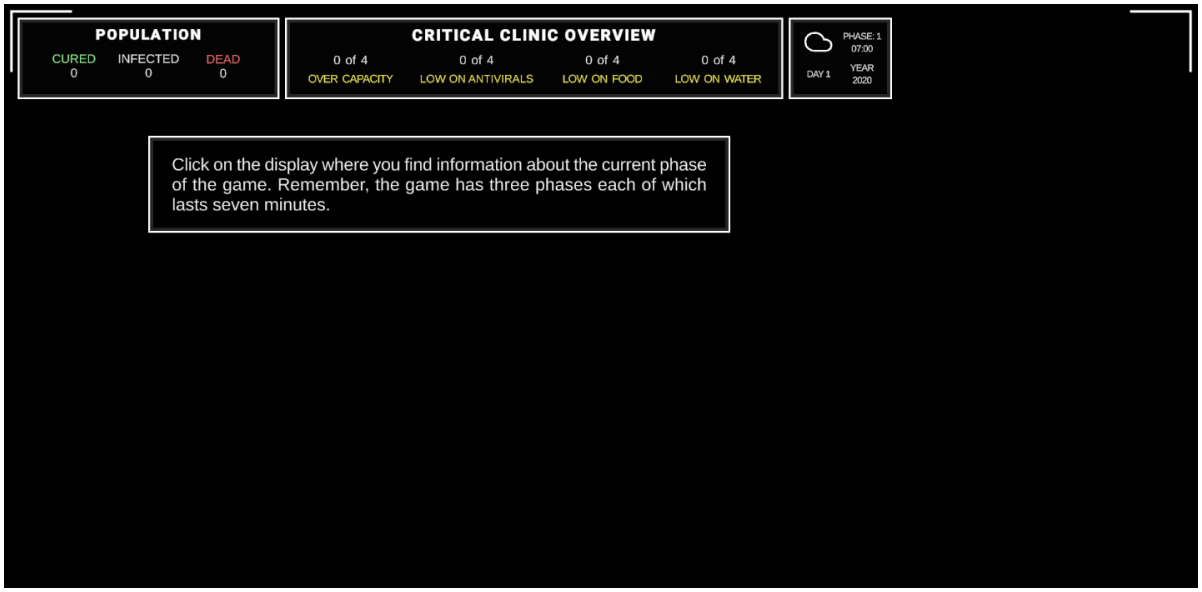


Figure 16. Competency Demonstration of the Phase of Game Play and Environmental Conditions.

The player, as shown in Figure 17, is now informed of the help feature, available by clicking on the ubiquitous ***i*** to request information.

Figure 17. Competency in Launching the Help Feature Found in any Window with an i.

The player proceeds to demonstrate competency via clicking the ***i*** found in the Unit Dispatch window. Upon clicking the ***i***, the following example help window is displayed. See Figure 18.

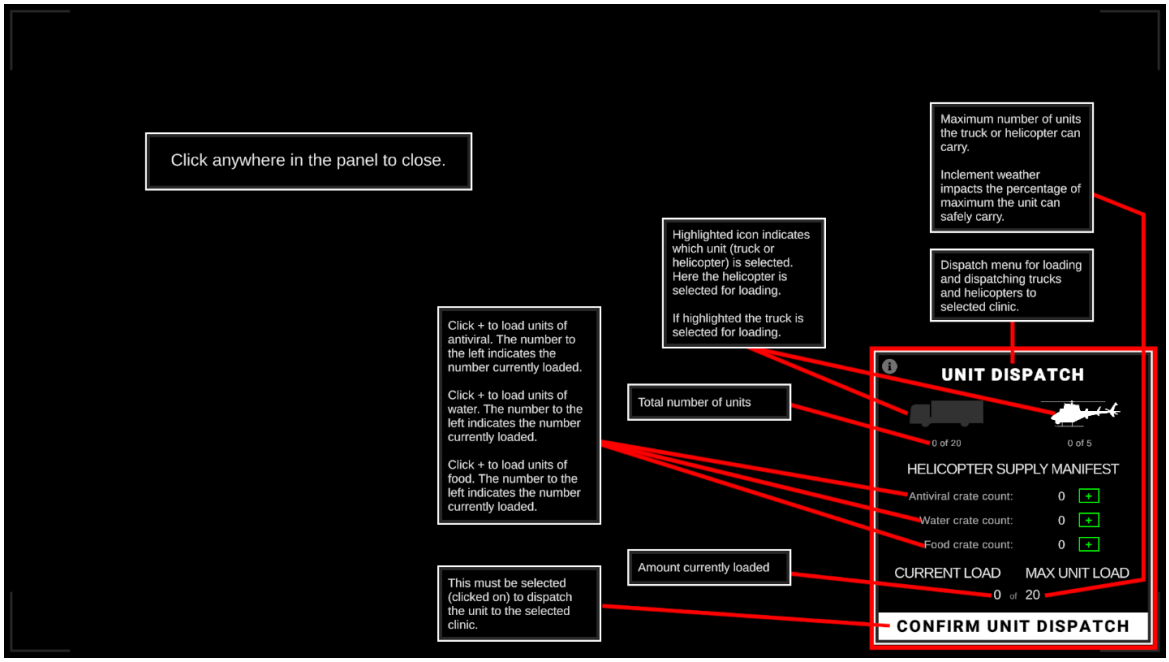


Figure 18. Example of Help Explanation.

At this point training is complete, and the player is informed the game is about to begin as shown in Figure 19. A countdown begins at three seconds and once it reaches zero, the main game is launched.

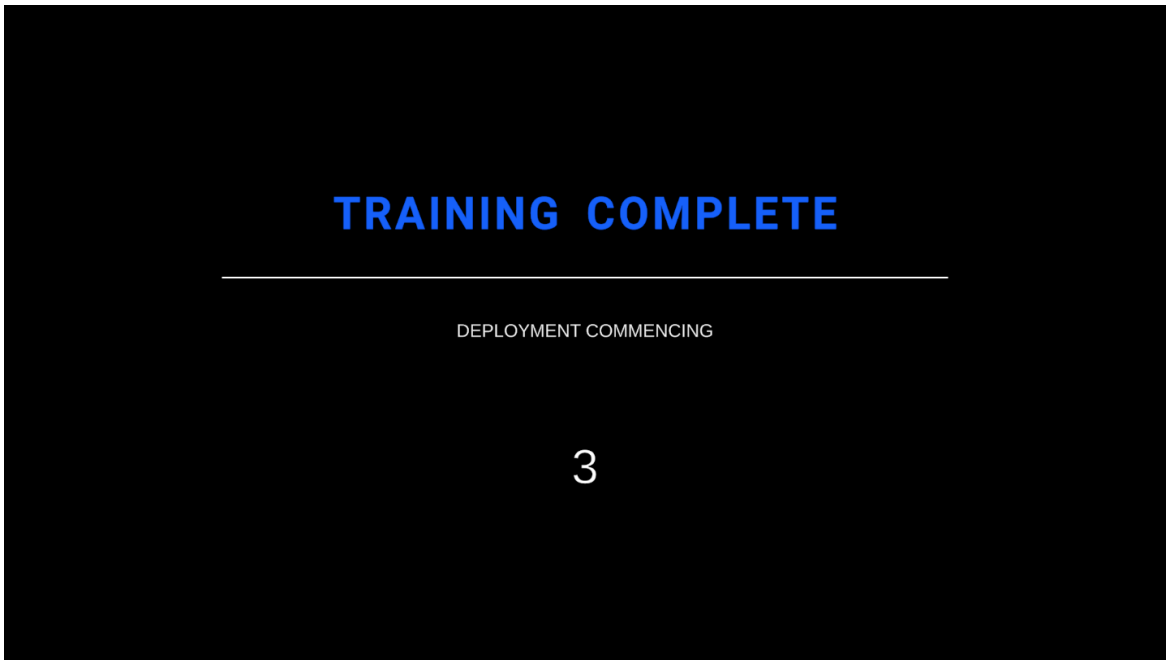


Figure 19. Informing Player Training is Complete and Game Play Begins in Three Seconds.

2.2.5 Game Segment 5: Main Game Loop, Phase 1

Approximate Time: 13 minutes 30 seconds to 20 minutes 30 seconds into the game.

Construct Assessed: ST: (See Section 3.0 for the ST items). The main game loop consists of three phases where the player monitors the status of the treatment centers and dispatches supplies to maximize the capability of treatment centers to mitigate the virus by treating patients. Environmental conditions evolve throughout the game with day turning to dusk, night, and dawn. In all, the simulated world goes through eight days during the game. During the first phase of play, the weather is good, with it degrading in phases two and three. Furthermore, the virus evolves during Phase 3 requiring additional resources per patient to effectively treat the patients.

*Resource***s.** Throughout gameplay, there are five helicopters and 20 trucks available to load with supplies and dispatch to the treatment centers. There is an unlimited number of antivirals, water, and food. As trucks are dispatched from the parking garage, they follow the roads in the city to deliver supplies and return via the roads to the parking garage. Helicopters fly directly point to point from the airfield to the treatment centers. As the transport vehicles are small relative to the other entities, a small diamond symbol is placed above each as it travels, to aid the player in observation the movement of the trucks and helicopters.

Phase 1 play opens with the world displayed in daylight and good weather. The landscape contains roads, buildings, trees, a river, mountains and other environmental (e.g., wind) and architectural details (e.g., landing strip). Weather is good and as the game progresses through Phase 1 the scene evolves to dusk, night, and dawn. Through the seven minutes of play during Phase 1 the simulated time of the game runs from day one to day three. Realistic changes occur, including sunsets and sunrises, building lighting, lights on trucks and helicopters and so forth.

Four treatment centers (hospitals and medical clinics) are in operation during Phase 1 with three additional coming online during Phase 2 and five more in Phase 3 of play. See Table 5 below.

The goal of the player is to minimize the number of deaths caused by the virus. This is done by ensuring the treatment centers have adequate supplies of antiviral, water, and food. Figure 20 presents a general model of the decision flow of an effective player.

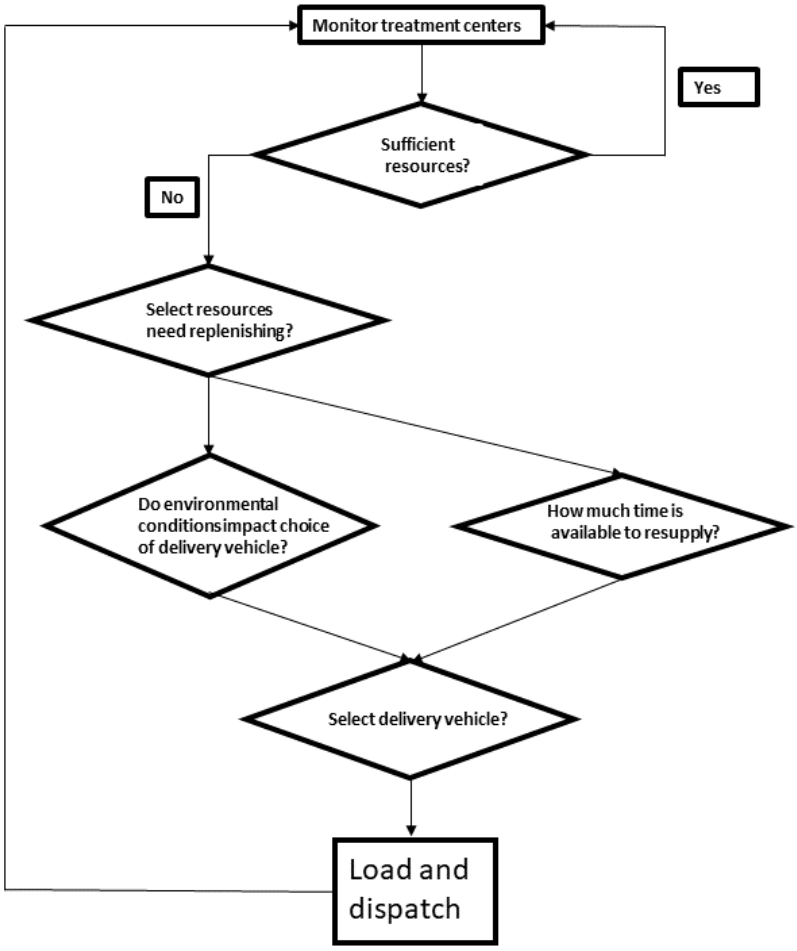


Figure 20. Example Cognitive Flow for a Player.

Table 5. Treatment Centers, Capacity, and Phase of Game they come into Play.

Treatment Center	Capacity	Phase Come Online
Common Wealth Hospital	250	1
Compass Health	175	1
Best Medical	175	1
Advanced Health Care	50	1
Mercy Hospital	250	2
New Line Urgent Care	175	2
Helping Hands Medical	50	2
St. John's Hospital	250	3
Gold Standard Health	175	3
Red Shield Urgent Care	175	3
24 Hour Urgent Care	50	3
Fair Life Community Health	50	3

2.2.6 Game Segment 6: Main Game Loop, Phase 2

Approximate Time: 20 minutes 31 seconds through 28 minutes 30 seconds of gameplay. Note: one minute in this timeline is for responding to the SA items.

Constructs Assessed: ST and AD: (See Section 3.0 for the ST and AD items). The second loop of main play begins during day four and continues into day six of simulated time into the virus pandemic. Three additional treatment centers come online (Table 5), and the player is instructed

that reports have been received indicating the virus is mutating, additional treatment centers are opening, and weather is worsening. See Figure 21.

Figure 21. Warning Provided at the Beginning of Phase 2 of Main Game Play.

Effective players often modify their strategies during this phase to handle the increased treatment center demand, the increased rate of consumption of supplies, and the worsening weather. Also, in Figure 21, the play world expands as the three new treatment centers are each located on the east side of the river. This increases the cognitive load on the player as they must pan to the right and click on the map (to keep treatment center information from blocking their view).

Environmental conditions begin to degrade, and the player sees rain, light fog, and lightening. Thunder is heard when lightning strikes. The game cycles through two additional days (five and six) and nights of simulated time.

Construct Assessed: SAs: (See Section 3.0 for SA items). At five minutes into play of Phase 2, the game is paused, and the SA items are presented for the first time as shown in Figure 22.

Figure 22. Screen Containing Drop Down Options for Measuring SA.

Upon completing the SA items, the game resumes for an additional two minutes of play. Once those two minutes are complete, Phase 2 ends and the player is provided a summary report of performance. See Figure 23.

Figure 23. End of Phase 2 Summary of Performance Screen Presented to the Player.

2.2.7 Game Segment 7: DR Mini-game

Approximate Time: Begins at 28 minutes 31 seconds into game.

Duration: Approximately two minutes for instruction. Seven minutes for the test. Note: If the test is not completed in seven minutes, the mini-game ends and the next phase of the game commences.

Construct Assessed: DR: The avatar comes back on screen and informs the player "A lightning strike on headquarters has damaged the control computer's logic boards. You need to repair the logic boards before you can resume control of the dispatch system." See Figures 24 and 25.

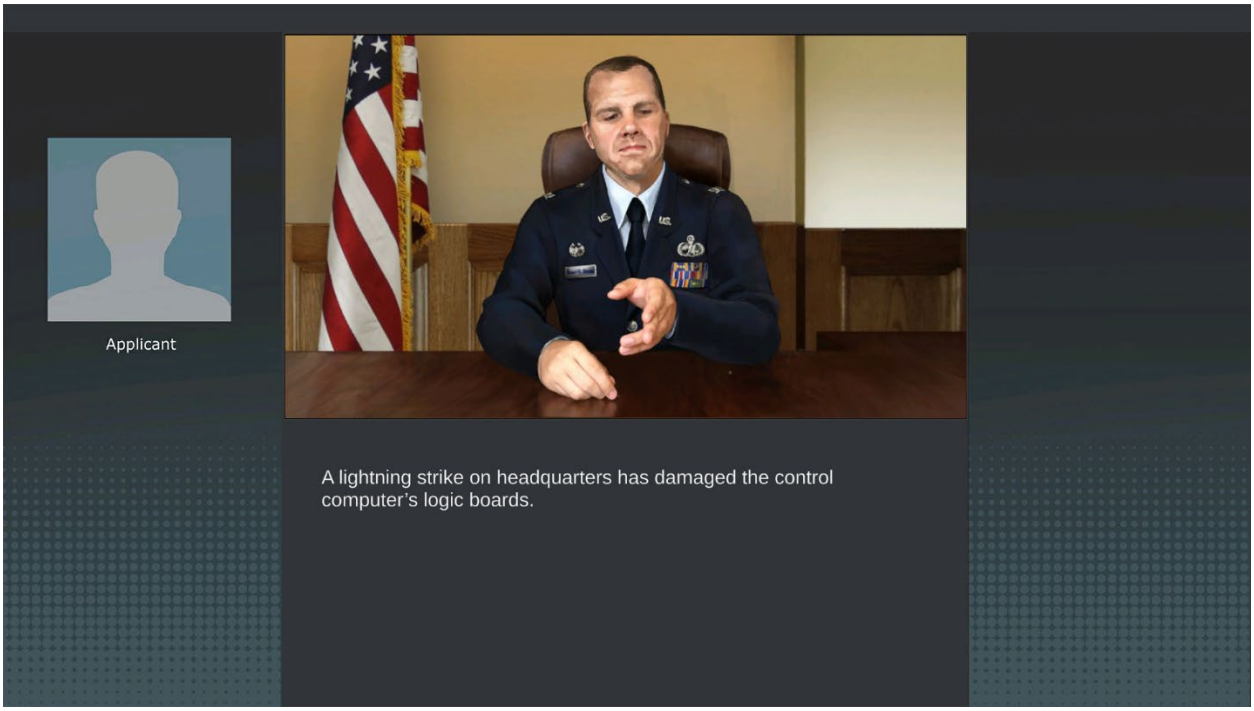


Figure 24. First Screen Introducing the DR Exercise.

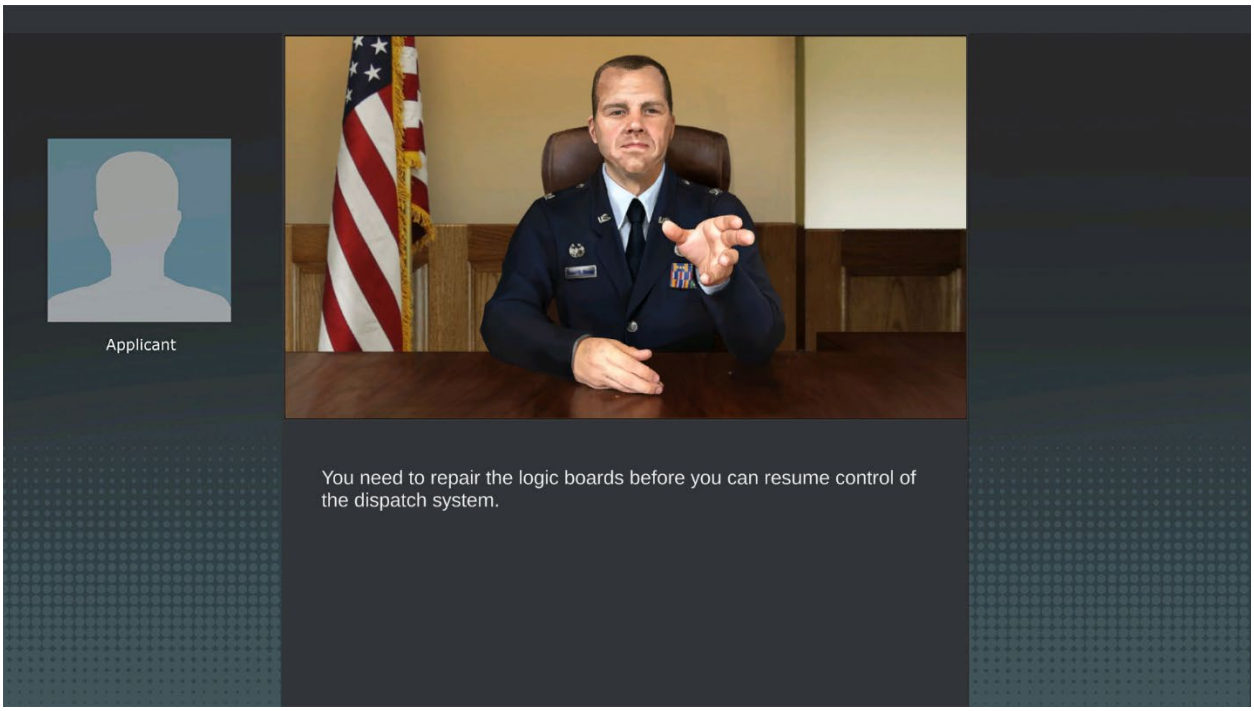


Figure 25. Second Introductory Screen for the DR Exercise.

The player is then instructed in the function of electronic circuit logic operators. The information in Figure 26 is read to the player who can take additional time processing the information, if desired, prior to pressing next to continue.

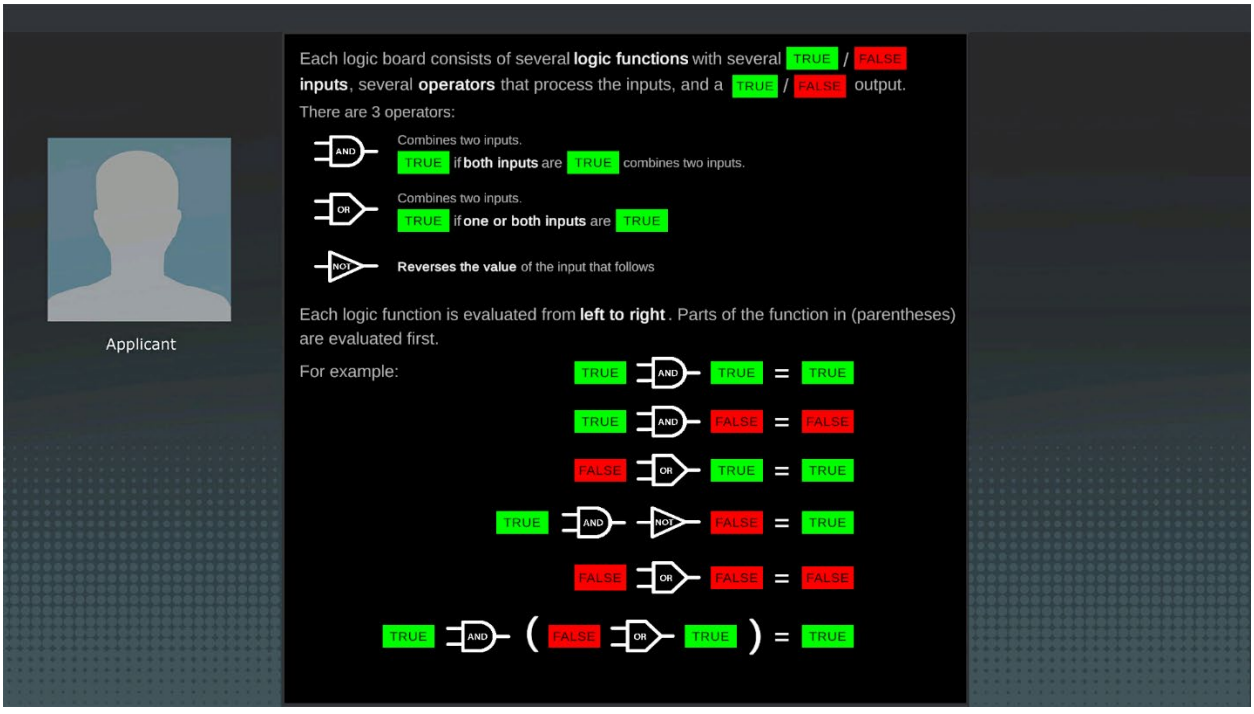


Figure 26. Instructions for Completing the Logic Board Repair Task.

Players utilize drag-and-drop to place operators (*AND, OR, NOT*) and outcomes (*TRUE, FALSE*) to complete the circuits. The game does not allow operators to be placed where outcomes belong and vice-versa. Additionally, the rectangles for operators are larger than for outcomes providing an additional clue to the player on how to complete the circuit. Figure 27 provides an example circuit and the complete items for the deductive reasoning task are presented in Section 3.0 and Appendix D.

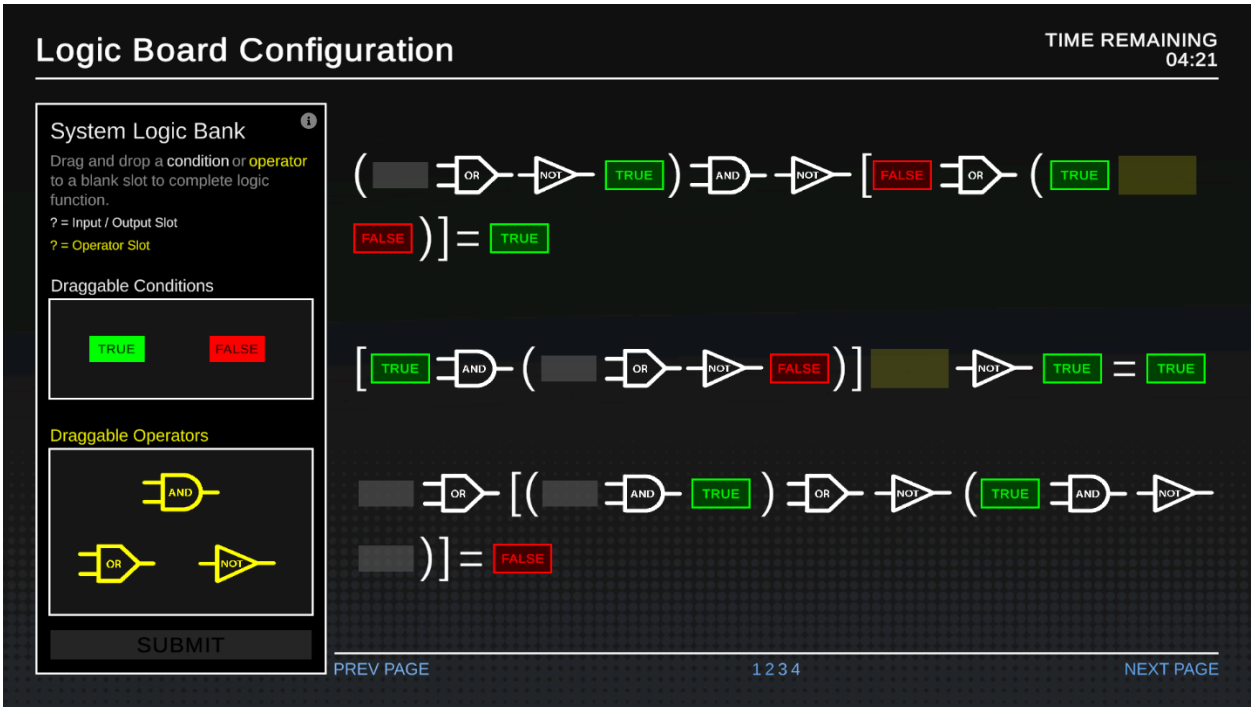


Figure 27. Example Items from the DR Mini-game

Upon completion of the deductive reasoning mini-game (or when segment time is up), the player is informed a system reboot is completing and the game resumes.

2.2.8 Game Segment 8: Main Game Loop, Phase 3

Approximate Time: Begins at 37 minutes 30 seconds into the game. Duration: eight minutes.

Constructs Assessed: ST and AD: The game continues during day six and proceeds through days seven and eight of simulated time. The game becomes additionally challenging to the player through further weather degrading and the addition of five additional treatment centers. The degraded weather forces the player to load less capacity on the transports (both trucks and helicopters) or risks them crashing and not delivering the supplies. The five additional clinics, see Table 5 and Figure 28, increase the cognitive load on the player as he/she is now monitoring the supply levels at 12 treatment centers (up from four in Phase 1 and seven in Phase 2 of play).

Figure 28. Screen Shot of World with Additional Clinics (in green) in Phase 3 of Gameplay.

Construct Assessed: SA: Five minutes into Phase 3 the game is paused as the candidate responds to SA items. The items are the same as those assessed in Phase 2 (see again Figure 22) but are presented in a different order to the player. Players respond by selecting from options in a drop-down list. After responding to the SA items play resumes and continues for two minutes. At the end of Phase 3, the player is provided a summary of performance. See Figure 29.

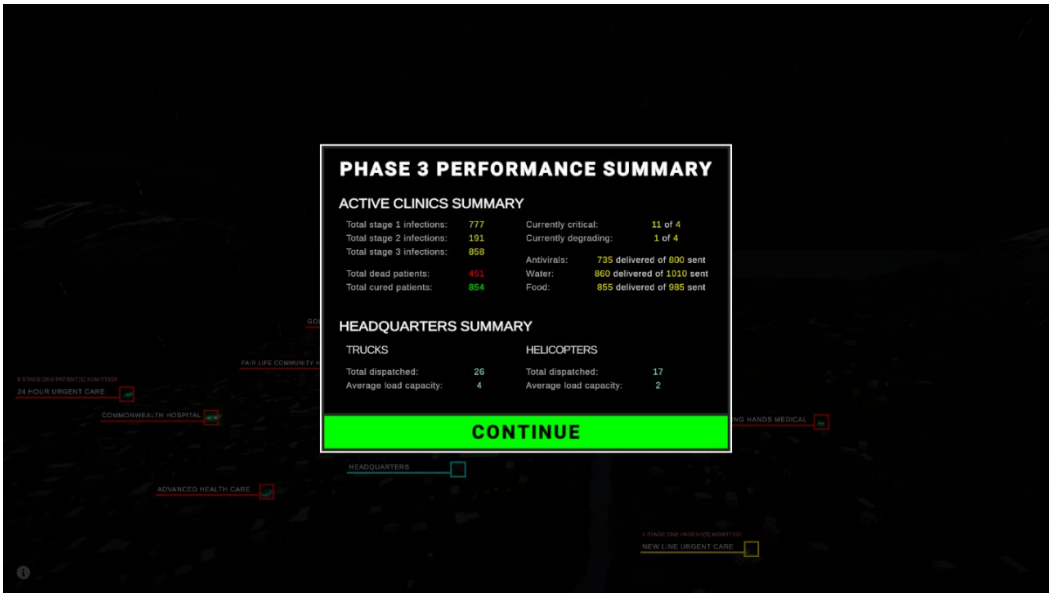


Figure 29. Screen Shot of Performance Summary Presented at End of Phase 3 of Gameplay.

2.2.9 Game Segment 9 - End of Game

Occurs at approximately 45 minutes 30 seconds into game. Players typically take one to two minutes to respond.

Assessment: Usability

Candidate: Responds to Usability items to evaluate game from Human Computer Interaction (HCI) standards. Note: this is only done during development and will be removed prior to final delivery to the USAF. The usability items are presented in Section 4.0.

Purpose: The candidate is thanked for their participation. Scores are recorded, displayed on dashboard, and printed.

2.3 Gameplay Parameter Specification

The Virus Slayer serious game was develop following the method of spiral development, where segments of the game were developed, pilot tested, and parameters adjusted to ensure the game is challenging and allows the measurement of the constructs of interest. There are three primary categories of parameters that were modified to allow for performance variance. These are city wide parameters (Figure 30), clinic parameters (Figure 31), and unit parameters (Figure 32). See the respective figures for further information on these parameters.

CITY WIDE PARAMETERS

Infection Rates

- High Average: 6 Seconds
- Moderate Average: 10 Seconds
- Low Average: 14 Seconds

Progression Rates

- Fast Rate: 30 Seconds
- Moderate Rate: 50 Seconds
- Slow Rate: 80 Seconds

Phase Multipliers

- Phase 1: 1
- Phase 2: 1.25
- Phase 3: 1.5

Alert Frequencies

- High Frequency: Display once every 5 events
- Moderate Frequency: Display once every 30 alerts
- Low Frequency: Display once every 45 alerts

Clinic Max Capacities

- Max Low: 50 Patients
- Max Moderate: 175 Patients
- Max High: 250 Patients

Figure 30. City Wide Parameter Specification.

Note. All clinics share these parameters depending on sector configuration; population rate equates to infection rate and wealth equates to progression rate.

A patient is cured at a rate of one per second while a clinic remains stocked with antivirals.

The patient progression rate is halved when a clinic has any supply in a critical state. A patient is progressed to death from the third stage of infection at the same rate as progression from any other state of infection.

TREATMENT CENTER *(Ordered by Activation Over Time)*	**ACTIVATION PHASE (SECTOR)**
(c0) Advanced Health Care ● Capacity: Low ● Distance from HQ: 294 Meters, 963 Feet, 0.2 Miles	Phase 1 (The Harbors) ● Population: High ● Wealth: Low ● Alert Frequency: Low
(c1) Best Medical ● Capacity: Moderate ● Distance from HQ: 808 Meters, 2652 Feet, 0.5 Miles	
(c2) Compass Health ● Capacity: Moderate ● Distance from HQ: 827 Meters, 2714 Feet, 0.5 Miles	
(c3) Commonwealth Hospital ● Capacity: High ● Distance from HQ: 565 Meters, 1854 Feet, 0.4 Miles	
(c4) Helping Hands Medical ● Capacity: Low ● Distance from HQ: 667 Meters, 2189 Feet, 0.4 Miles	Phase 2 (Cybil Hills) ● Population: Low ● Wealth: High ● Alert Frequency: High
(c5) Mercy Hospital ● Capacity: High ● Distance from HQ: 689 Meters, 2260 Feet, 0.4 Miles	
(c6) New Line Urgent Care ● Capacity: Moderate ● Distance from HQ: 390 Meters, 1278 Feet, 0.2 Miles	
(c7) Anytime Urgent Care ● Capacity: Low ● Distance from HQ: 919 Meters, 3016 Feet, 0.6 Miles	Phase 3 (Downtown) ● Population: High ● Wealth: Moderate ● Alert Frequency: High
(c8) Fair Life Community Health ● Capacity: Low ● Distance from HQ: 609 Meters, 1998 Feet, 0.4 Miles	
(c9) Gold Standard Health	

- Capacity: Moderate
- Distance from HQ: 1105 Meters, 3625 Feet, 0.7 Miles

(c10) Red Shield Urgent Care
- Capacity: Moderate
- Distance from HQ: 523 Meters, 1716 Feet, 0.3 Miles

(c11) St. John's Hospital
- Capacity: High
- Distance from HQ: 214 Meters, 701 Feet, 0.1 Miles

Figure 31. Treatment Center Parameter Specification.

Trucks
- Speed: 40 Meters per Second (90 Miles per Hour)
- Safe Load Capacity: 25 Crates
- Max Load Capacity: 40 Crates
- Light Rain Crash Probability: 10%
- Heavy Rain Crash Probability: 20%
- Storm Crash Probability: 30%

Helicopters
- Speed: 80 Meters per Second (180 Miles per Hour)
- Safe Load Capacity: 15 Crates
- Max Load Capacity: 20 Crates
- Light Rain Crash Probability: 10%
- Heavy Rain Crash Probability: 30%
- Storm Crash Probability: 40%

Figure 32. Transportation Unit Parameter Specification.

3.0 ITEM ANALYSIS OF CONSTRUCT INDICATOR VARIABLES

3.1 Overview

The present chapter provides a description of the development of items to serve as indicators for the six constructs. Three constructs, AT, DR, and AL are measured as part of independent mini-games. Those items were developed through traditional scale development approaches by having individuals respond to scale items. The other three constructs, SA, ST, and AD, consist of items developed from gameplay metrics.

Items for the mini-games (AT, DR, and AL) were piloted in two development studies to select items for inclusion in the full Virus Slayer serious game. A final development study was then conducted using the full Virus Slayer serious game to develop game play metrics and examine scale inter-correlations. In the sections below, we describe characteristics of the mini-game development samples and the full game development sample. We then describe the final item parameters for each of the six construct measures.

3.2 Development Sample Characteristics

3.2.1 Mini-game Combined Development Sample Characteristics

AT, DR, and AL are assessed using independent mini-games within the larger Virus Slayer serious game. For each of these three scales, to select final items for inclusion in the game, we developed a large item pool then collected pilot data using Amazon Mechanical Turk (MTurk). Participants that did not fit the required demographic criteria, i.e., from the United States, between 18-30 years old, and speak English as first language, were screened out during assessment. Additionally, those who completed the assessment multiple times were screened out during the data cleaning process.

We conducted two separate studies (MTurk refers to these as Human Intelligence Tasks [HIT]). The first used a large pool of items which were screened based on psychometric properties. A second study was conducted after developing additional items for consideration. Below are demographic descriptive results of all respondents from the US who participated in MTurk HITs. This combined sample includes only those who successfully completed the studies, i.e., those who fit the required criteria. In total, there were 466 individuals between the ages of 18-30, of whom 218 (46.8%) were female, 246 (52.8%) male, and 2 (.4%) chose not to gender identify.

The distribution of educational levels of participants is depicted in Table 6.

Table 6. Education Distribution

Education	Count	Percentage
Less than high school	4	0.9%
High school graduate	49	10.5%
Some college	106	22.8%
Associate degree	57	12.2%
Bachelor's degree	201	43.1%
Master's degree	42	9.0%
Doctoral degree	1	0.2%
Professional degree	6	1.3%

Table 7 through Table 9 provide a perspective of the distribution of participants by race and ethnicity.

Table 7. Race Distribution

Race	Count	Percentage
American Indian or Alaska Native	5	1.1%
American Indian or Alaska Native, Other (please specify)	1	0.2%
Asian	23	4.9%
Black or African American	69	14.8%
Black or African American, Asian	3	0.6%
Other	4	0.9%
Prefer not to answer	5	1.1%
White	347	74.5%
White, Asian	4	0.9%
White, Black or African American	2	0.4%
White, Black or African American, American Indian or Alaska Native	1	0.2%
White, Black or African American, Asian	1	0.2%
White, Other	1	0.2%

Table 8. Race Distribution - Condensed

Race	Count	Percentage
American Indian or Alaska Native	5	1.1%
Asian	23	4.9%
Black or African American	69	14.8%
Mixed Race	14	3%
Other	3	0.6%
Prefer not to answer	5	1.1%
White	347	74.5%

Table 9. Distribution of Spanish, Hispanic and Latino/a/e Respondents

Spanish, Hispanic, or Latino/a/e	Count	Percentage
Hispanic	4	0.9%
Latino/a/e	3	0.6%
None of these	449	96.4%
Prefer not to answer	9	1.9%
Spanish	1	0.2%

3.2.2 Full Gameplay Development Sample Characteristics

After pilot testing the mini-game items, the final selected items were incorporated into the full Virus Slayer serious game. We then collected a final development sample to evaluate the psychometric properties of the gameplay-based construct measures (SA, ST, AD) and to estimate correlations among the six scales.

Research participants for the full gameplay development sample were recruited from both MTurk and a subject pool from a large southeastern university. Nearly all respondents (N=267) were from MTurk with only N=10 coming from the university sample. Of the 277 combined sample, N=173 (62.5%) were male and N=103 (37.2%) were female with one individual preferring not to gender self-identify. Distribution of educational level is reported in Table 10 with race and ethnicity information provided in through Table 14.

Table 10. Education Distribution

Education Level	Count	Percentage
High school	32	11.6%
Some college	123	44.4%
Associate degree	14	5.1%
Bachelor degree	107	38.6%

Table 11. Distribution by Race

Race	Count	Percentage
American Indian or Alaska Native	2	0.7%
Asian	21	7.6%
Asian, Native Hawaiian or Pacific Islander	2	0.7%
Black or African American	29	10.5%
Black or African American, Asian, Native Hawaiian or Pacific Islander	1	0.4%
Hispanic	2	0.7%
Indian American	1	0.4%
Italian, Irish	1	0.4%
Latino	2	0.7%
Prefer not to answer	3	1.1%
Puerto Rican	1	0.4%
White	195	70.4%
White, American Indian or Alaska Native	2	0.7%
White, American Indian or Alaska Native, Asian	1	0.4%
White, Asian	9	3.2%
White, Black or African American	3	1.1%
White, Blac or African American, Asian	1	0.4%
White, Other	1	0.4%

Table 12. Race Distribution – Condensed

Race	Count	Percentage
American Indian or Alaska Native	2	0.7%
Asian	21	7.6%
Black or African American	29	10.5%
Mixed Race	20	7.2%
Other	7	2.5%
Prefer not to answer	3	1.1%
White	195	70.4%

Table 13. Percentage of Respondents Identifying as Hispanic, Latino/a/e, or Spanish

Hispanic, Latino, or Spanish	Count	Percentage
None of these	233	84.1%
Prefer not to answer	5	1.8%
Yes	39	14.1%

Table 14. Distribution of Hispanic, Latino/a/e, and Spanish

Hispanic, Latino/a/e, or Spanish?	Count	Percentage
Hispanic	18	46.2%
Latino/a/e	16	41%
Spanish	5	12.8%

3.2.3 Mini-game-Based Construct Measures: AT, AL and DR

The game begins with the person to be assessed informed that a search is on for an individual with an aptitude for both virus treatment and logistics. These areas were selected to be face valid for the context of the serious game. Virus items were written based on information in Lodish et al. (2000). The AT items are administered under the cover of a selection test to identify the most capable candidate. After the AT items are administered, the candidate is informed they are selected and we want to understand how they learn so additional candidates might also be identified.

At this point, the AL items are administered. As defined here, AL is similar to *need for cognition* (Cacioppo & Petty, 1982). We modified items from their scale for use here, as well as developing similar items, primarily targeting the low end of the trait dimension (e.g., preference for routine simple tasks).

To measure DR, a second mini-game is administered midgame. The player is informed that a lightning strike has destroyed an electrical circuit board. The player needs to reconstruct this board by the candidate before the main game can continue.

For all three scales, we used responses from the mini-game development sample to evaluate a large pool of items and select final items for inclusion in the full game. We used IRT-based item analyses to select the final items for all three scales. After incorporating the selected items into the main game, to maximize the precision of the final item parameter estimates, we combined the mini-game development sample and the full gameplay development sample and estimated item parameters for the full sample. These item parameters were used to estimate scale reliabilities and inter-correlations.

For estimating factor scores, we opted for maximum likelihood (ML) estimation. Other approaches, such as Expected A Posteriori (EAP) scores, can sometimes be more reliable than ML scores, but the ML approach is computationally easier to implement outside of a statistical software environment as part of the serious game program. Differences in reliability tend to be small, and factor scores estimated by alternative methods are usually highly correlated. For IRT scores, marginal reliability refers to the reliability estimate computed using the test information function (based on the item parameters) and assuming a standard normal score distribution:

$$r_{xx\prime} = \int_{-\infty}^{\infty} \frac{I(z)}{I(z)+1} \phi(z)\, dz$$

where $I(z)$ is the test information at trait level z and $\phi(z)$ is the density of the standard normal distribution at trait level z. Marginal reliability can be interpreted as a theoretical reliability estimate for a highly diverse sample. Empirical reliability is computed using the estimated factor scores and their associated standard errors:

$$r_{xx\prime} = \mathrm{Var}(\hat{z}_i) / \left(\mathrm{Var}(\hat{z}_i) + \overline{SE^2}_{\hat{z}_i}\right)$$

Empirical reliability can be interpreted in the same way as a classical reliability estimate—as the sample-specific ratio of true-score variance to true-score plus error-score variance.

3.2.4 AT

3.2.4.1 Scale Information

The AT scale assesses the degree to which individuals analyze information and use logic to address work-related issues and problems using a series of items about logistics and virology. Items were analyzed using a 2-parameter logistic IRT model. We additionally examined results for a 3-parameter logistic IRT model where the guessing parameter was fixed to the chance value of 0.25. However, comparison of Akaike Information Criterion (AIC) values for the 2-parameter and three-parameter models showed that the more parsimonious 2-paramter model should be retained (two-parameter AIC: 4508.43, 3-parameter AIC: 4994.96).

Based on analyses in the mini-game development sample, 13 items were retained. In the combined full sample, the final set showed good IRT marginal reliability, $r_{xx'} = .83$, IRT empirical reliability, $r_{xx'} = .78$, and α reliability, $\alpha = .81$. In the combined full sample, the 13 items have Fisher information > 2 (standard error < .71) between $z = -1.66$ and $z = 2.64$ and have Fisher information > 4 (standard error < .50) between $z = -1.22$ and $z = 1.38$.

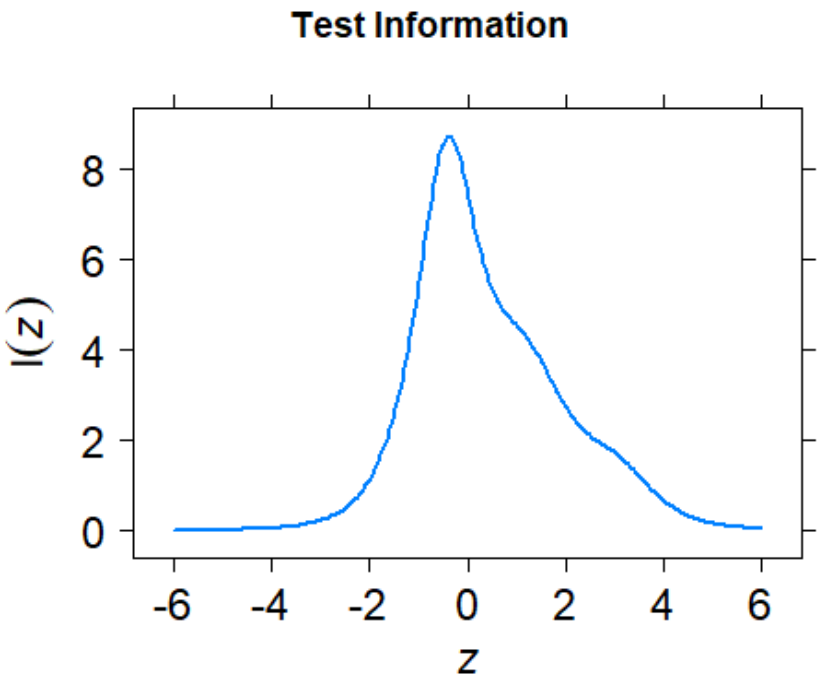


Figure 33. Test Information Plot of the 13 Retained AT Items in the Combined Full Sample.

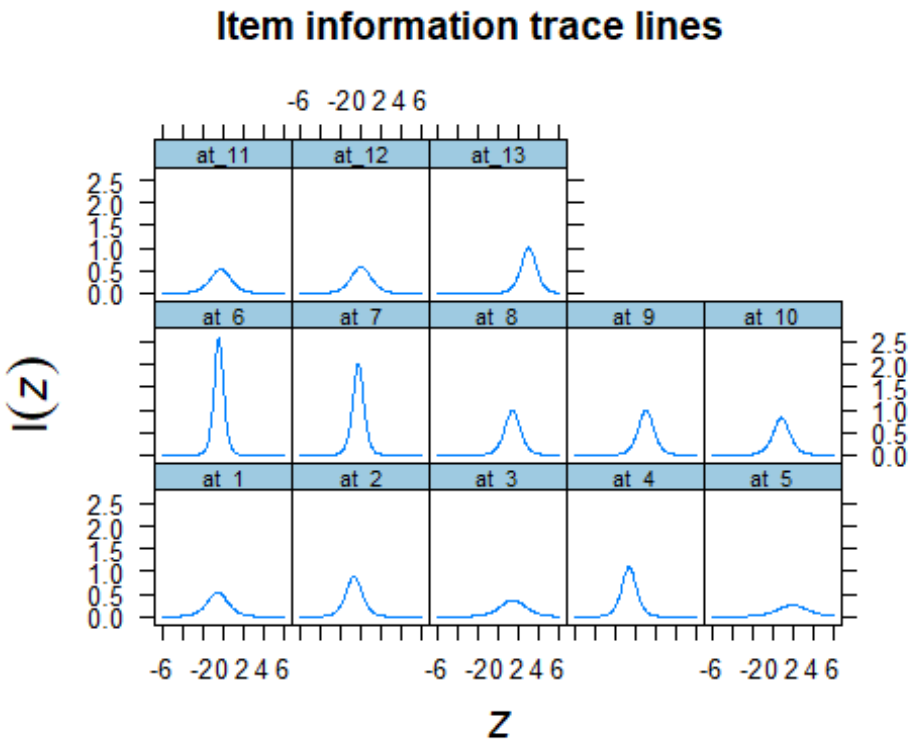


Figure 34. Item Information Trace Line Plots in the AT Scale in the Combined Full Sample.

Below, each item is presented along with item statistics in the combined full sample and a graph showing the item's response distribution in the mini-game development sample. The correct answer for each item is highlighted.

Big Drug Pharmaceutical has fixed overhead costs for drug development of $5 million To develop drug Zeta it needs to purchase supply units Alpha and Beta. Alpha costs $10.3 per supply unit and Beta costs $12.70 per supply unit.

1. The cost of supply Alpha goes up 30%. What is the impact on *Big Drug Pharmaceutical*?
   a. It can expect to pay an additional $3.09 per unit (correct)
   b. The $5 million overhead will increase by 30%
   c. Due to diminishing returns the overhead cost will reduce by 30%
   d. The per unit cost of Beta can be expected to increase by 30%

Table 15. Item Parameters for Analytical Thinking Question 1

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
1	385	0.66	0.47	0.02	0.80	1.47	-0.61

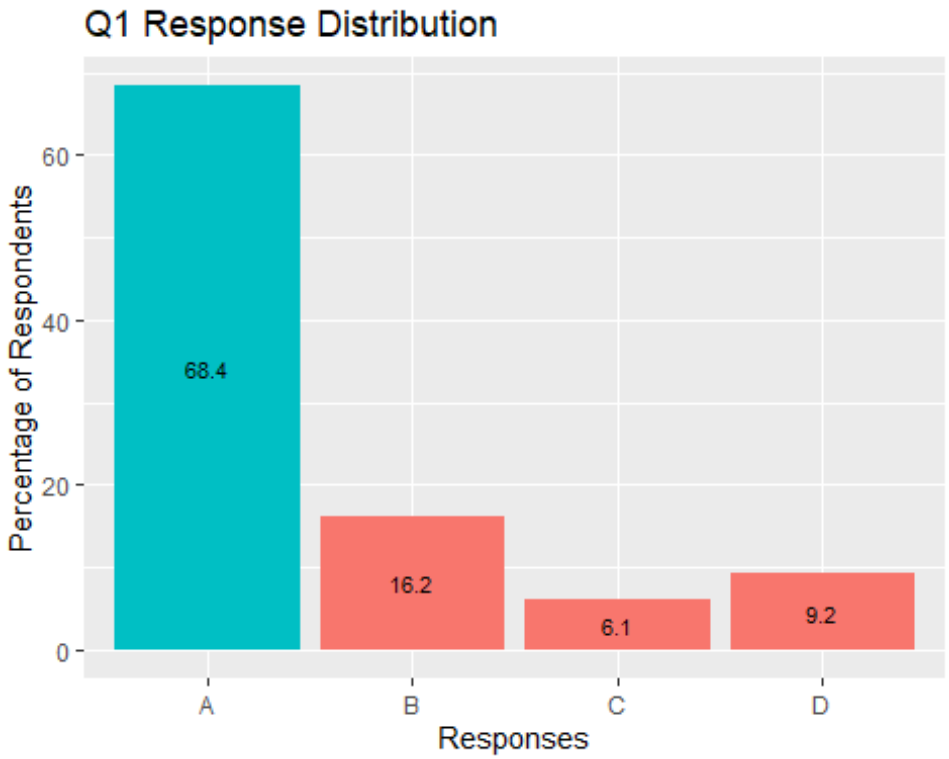


Figure 35. Response Distribution for AT Question 1 in Development Sample.

2. A treatment regime with an antiviral agent *Theta* is likely to cure 2/3 of 40% of those treated with a 1/3 chance of killing 20% of those treated due to uncontrollable adverse reactions. Which equation provides the expected number of cured patients?

e. 2/3(40%) + 1/3 (-20%) (correct)
f. 1/3 (20%) + 2/3(40%)
g. 1/3(20%) + 2/3(-40%)

Table 16. Item Parameters for AT Question 2

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
2	385	0.70	0.46	0.02	0.80	1.88	-0.70

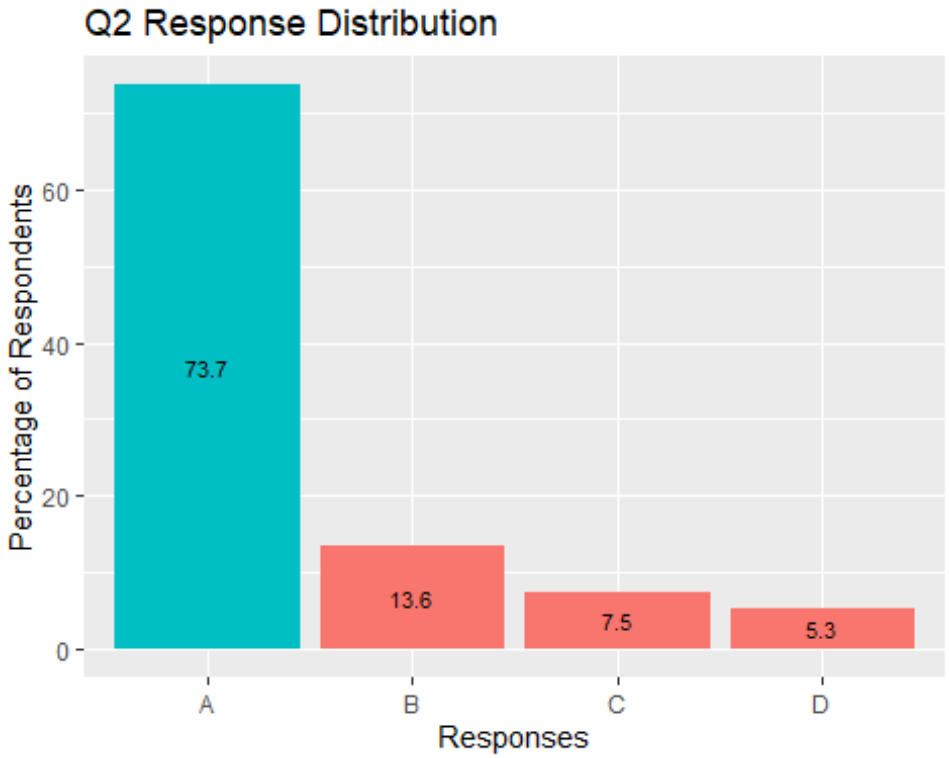


Figure 36. Response Distribution for AT Question 2 in Development Sample

3. A treatment regime with an antiviral agent *Beta* is likely to cure 50% of 150% of those treated with a 50% chance of killing 50% of those treated due to uncontrollable adverse reactions. Which equation provides the expected number of cured patients?

h. ½ (150%) + ½ (50%)
i. ½ (-150%) + ½ (50%)
j. (½ - 1.5)(150%) + ½ (-50%)
k. (1- .5)(150%) + 1/2(-50%) (correct)

Table 17. Item Parameters for Analytical Thinking Question 3

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
3	385	0.20	0.40	0.02	0.81	1.21	1.46

Figure 37. Response Distribution for AT Question 3 in Development Sample.

In a 40-hour workweek, *Big Drug Pharmaceutical* can manufacture 100 class *Alpha* antiviral agents or 40 class *Beta* antiviral agents.

4. How many class *Alpha* antiviral agents can be manufactured in one hour?

l. 2.5 (correct)
m. 1.5
n. 1
o. 2

Table 18. Item Parameters for AT Question 4

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
4	385	0.70	0.46	0.02	0.79	2.09	-0.63

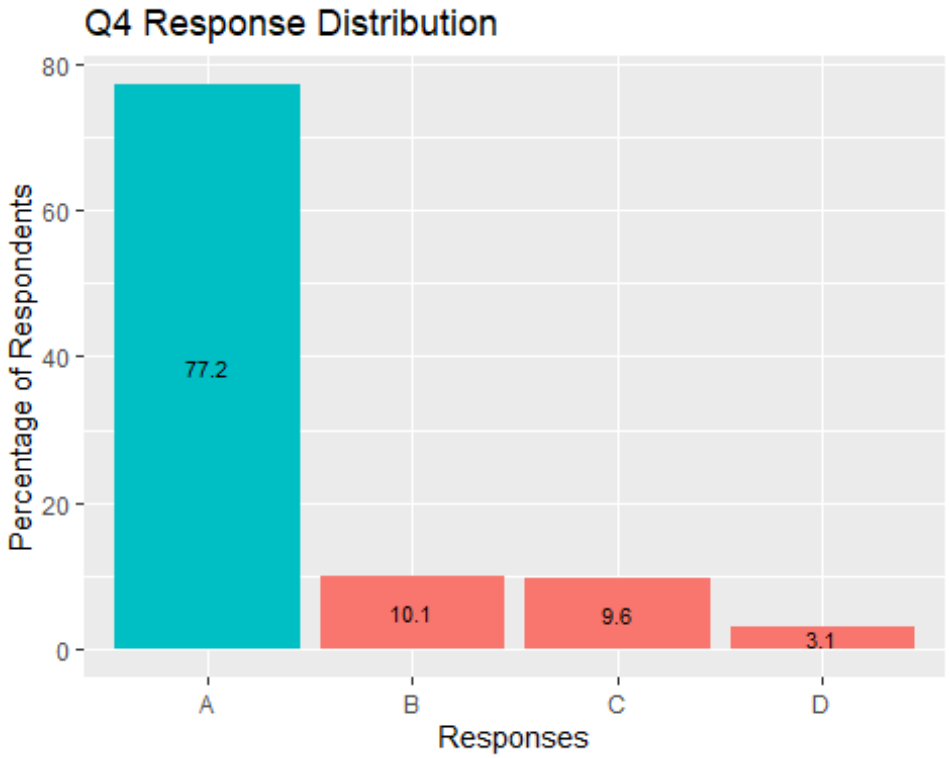


Figure 38. Response Distribution for AT Question 4 in Development Sample.

5. A line on the *xy*-plane passes through the origin and has a slope of 1/6. Which of the following points lies on the line?

a. (0,6)
b. (1,6)
c. (6,6)
d. (12,2) (correct)

Table 19. Item Parameters for AT Question 5

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
5	385	0.15	0.36	0.02	0.81	1.00	2.01

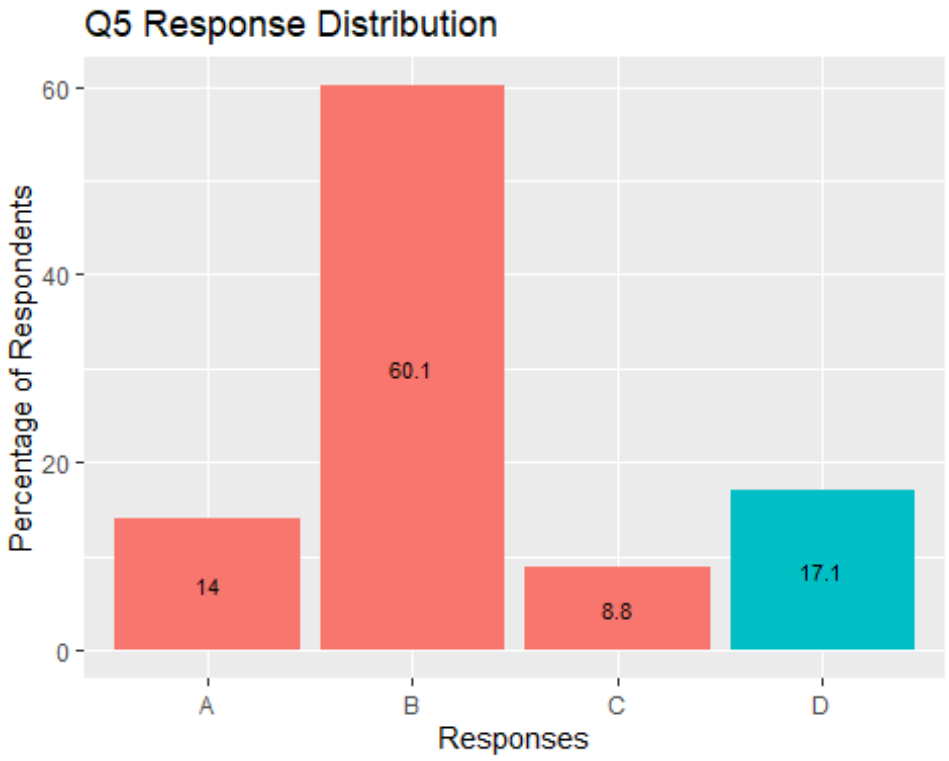


Figure 39. Response Distribution for AT Question 5 in Development Sample.

6. A helicopter has an ability to lift a maximum combined weight of 5,200 pounds. If the pilot and the fully fueled helicopter weigh 3,900 pounds how much cargo can it carry?

a. 1,300 lbs. (correct)
b. 5,200 lbs.
c. Not possible to determine without knowing the weight of each parcel in the cargo.
d. 3,900 lbs.

Table 20. Item Parameters for AT Question 6

		Classical Item Parameters					IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}		a	b
6	385	0.68	0.47	0.02	0.79		3.23	-0.48

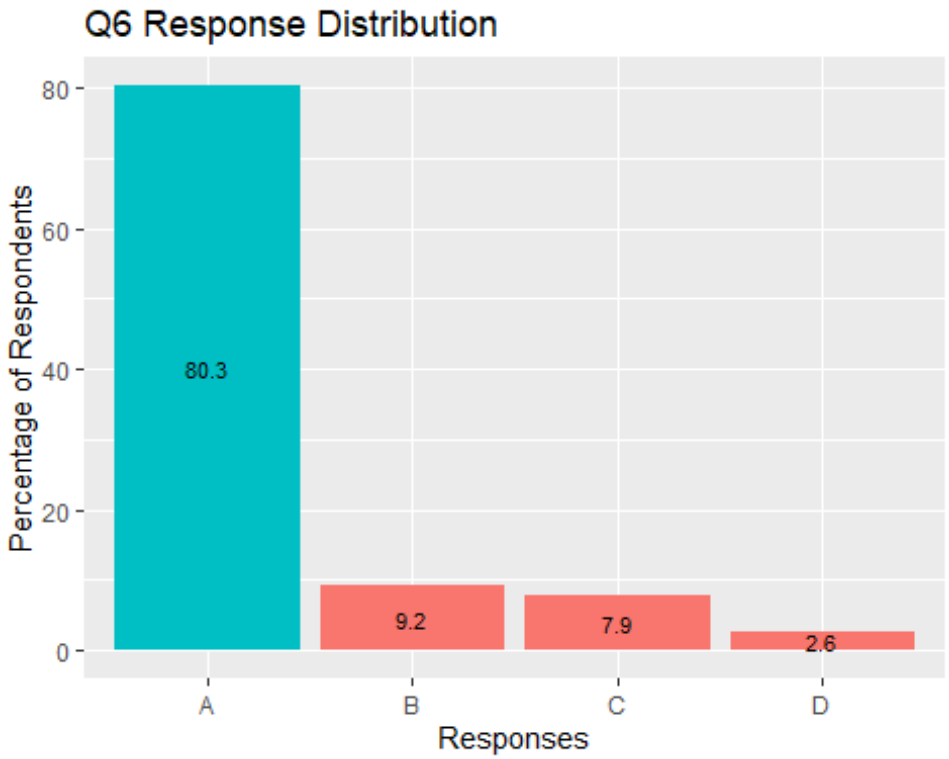


Figure 40. Response Distribution for AT Question 6 in Development Sample.

Questions 7 and 8 refer to the following statement: In a 40-hour workweek, a dispatcher can move either 80 trucks (t) or 10 helicopters (h).

7. How long does it take to load a helicopter?

a. 4 hours (correct)
b. 8 hours
c. 6 hours
d. 2 hours

Table 21. Item Parameters for AT Question 7

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
7	385	0.60	0.49	0.02	0.79	2.84	-0.26

Figure 41. Response Distribution for AT Question 7 in Development Sample.

8. Which equation below best represents the number of trucks and helicopters that can be loaded in 40 hours?

a. $0.5\,t + 4\,h \geq 40$
b. $0.5\,t + h = 40$
c. $t + 4\,h = 40$
d. $0.5\,t + 4\,h \leq 40$ (correct)

Table 22. Item Parameters for AT Question 8

		Classical Item Parameters					IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}		a	b
8	385	0.14	0.34	0.02	0.80		1.98	1.43

Figure 42. Response Distribution for AT Question 8 in Development Sample.

9. Medical supplies, food, and water are transported from the manufacturer to a warehouse to be dispersed to clinics. The process of unloading at the warehouse and reloading onto trucks or helicopters so they can be sent to clinics results in a 7% loss due to damage and theft. If the total amount of medical supplies, food, and water manufactured is 3 tons, which of the equations below best expresses the amount available for delivery to the clinics?

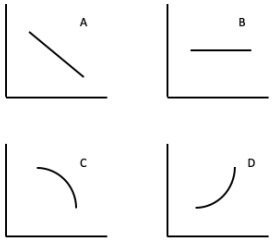
a. .93 * (6000 lbs.) (correct)
b. .03 * 3 tons
c. .07 * total amount manufactured
d. .07 * total delivered to clinics

Table 23. Item Parameters for AT Question 9

		Classical Item Parameters					IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}		a	b
9	385	0.21	0.41	0.02	0.80		1.99	1.06

Figure 43. Response Distribution for AT Question 9 in Development Sample.

Question 10 refers to the panels in the figure below.



10. *Big Drug Pharmaceutical* has developed a new antiviral treatment for a mutation of the virus plaguing the United States. Sixty individuals are treated with the new drug at varying doses. As dosing increased, the number of individuals who improved decreased. Which graphs best represents the relationship between the new drug and the outcome?

a. A and B
b. B and D
c. C and B
d. A and C (correct)

Table 24. Item Parameters for AT Question 10

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
10	385	0.26	0.44	0.02	0.80	1.82	0.88

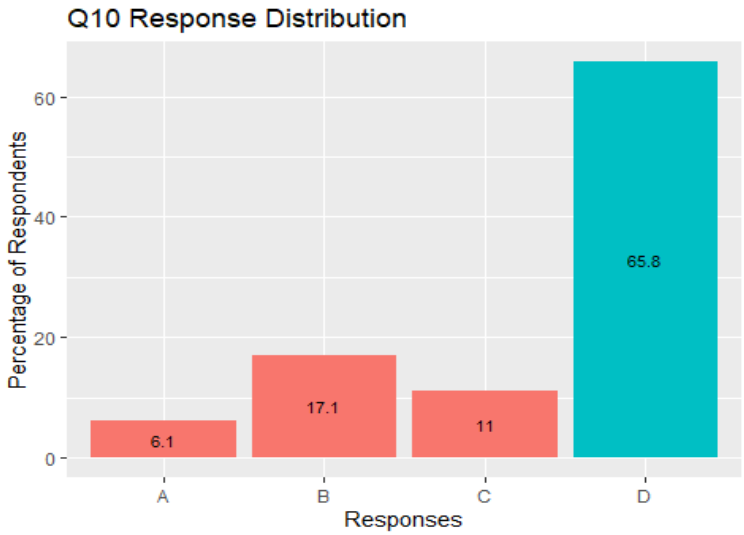


Figure 44. Response Distribution for AT Question 10 in Development Sample.

Question 11 is based on the information contained in the following fact sheet about viruses.

i. Some animal viruses and all retroviruses are able to integrate their genomes into the chromosomes of a host cell. It is then possible that abnormal cells will replicate with cancer eventually developing.
ii. Viruses are important tools in cell biology research.
iii. Recent research has developed an approach using recombinant viruses as carriers of selected genes into cells. When this occurs, viral genes required for the lytic cycle are replaced by other genes.
iv. Viral infections begin when protein on the surface of a viron (individual viral particles) bind to the surface receptors of the host cell. The specificity with which this occurs determines the host range of the virus.
v. Viruses are parasites within host cells and replicate only after the host cells are infected.
vi. Plaque assays are used to count and clone viruses. All the virons in any particular plaque are used to derive the single parental virion that infected the original cell at the center of the plaque.
vii. Progeny neucleocapsids of enveloped viruses are released by depositing viral membrane proteins through a process called budding.
viii. Virons contain either an RNA or a DNA genome.
ix. After infection of the host cell, it is possible for bacterial viruses to undergo a process whereby the viral genome is integrated into the host-cells chromosomes forming a prophage that is replaced when the host genome is replicated.

11. Viruses are never used for good (False; derived from ii.)

Table 25. Item Parameters for AT Question 11

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
11	343	0.59	0.49	0.03	0.80	1.46	-0.30

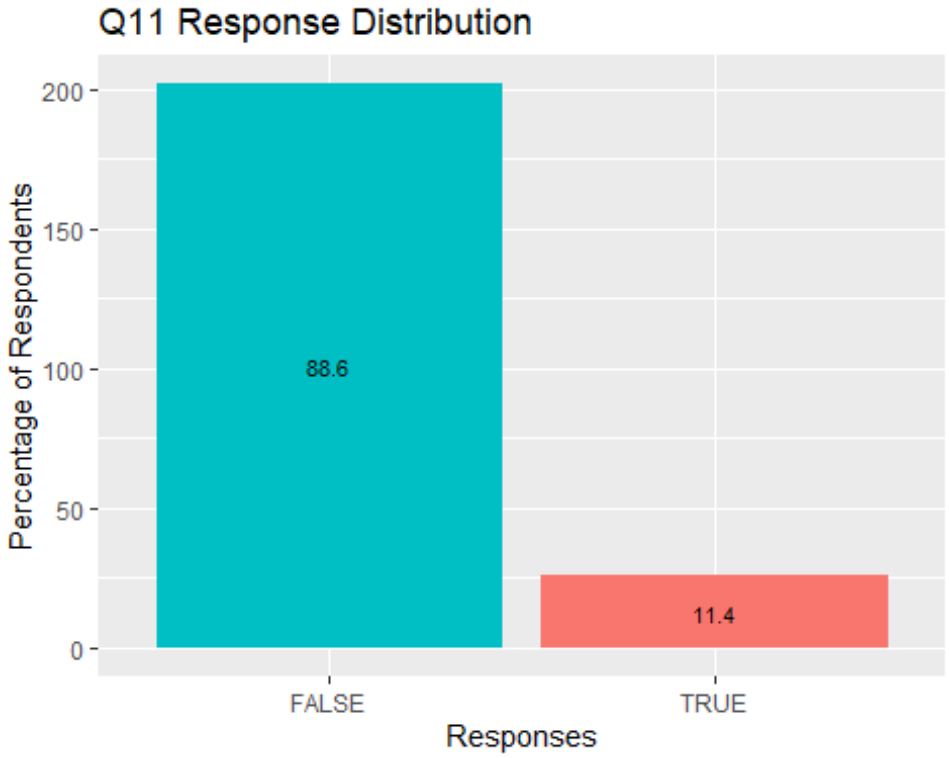
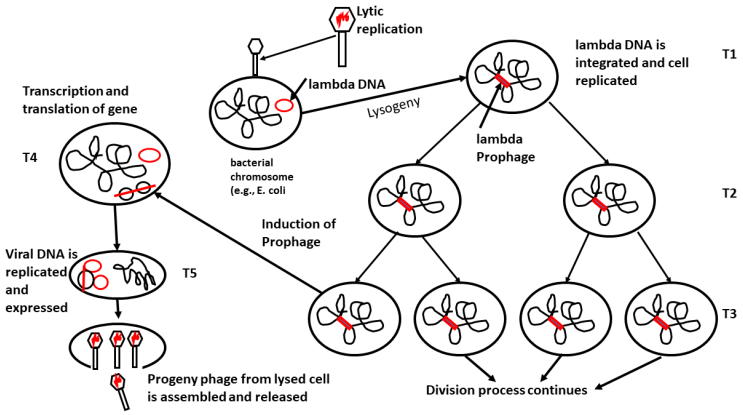


Figure 45. Response Distribution for AT Question 11 in Development Sample.

Questions 12 & 13 refer to the information contained in the figure below.



12. According to the figure, RNA is an essential component at which phase.

    a. T1
    b. T5
    c. T4
    d. RNA is not an essential component (correct)

Table 26. Item Parameters for AT Question 12

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
12	385	0.50	0.50	0.03	0.80	1.54	0.01

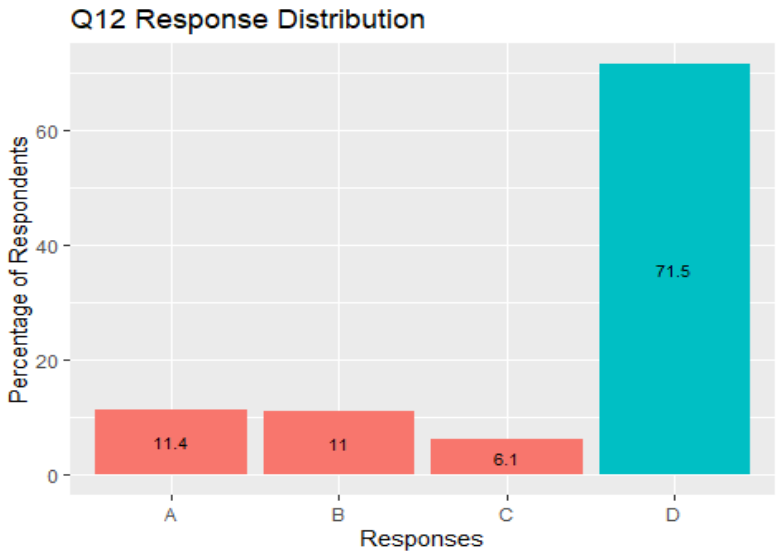


Figure 46. Response Distribution for AT Question 12 in Development Sample.

13. Based on the information contained in the figure, one can infer which two points:

a. In the lysogenic cycle, the viral proteins break the circular bacterial DNA and inserts itself to become part of the host DNA. (correct)
b. In the lysogenic cycle, the viral proteins break the circular bacterial DNA and inserts itself to become part of the host RNA.
c. Viral DNA inserted into the host DNA causes a process called Lysogeny.
d. After lysogeny, virus D DNA is referred to as D Prophage. (correct)

Table 27. Item Parameters for AT Question 13

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
13	384	0.01	0.11	0.01	0.82	2.01	3.04

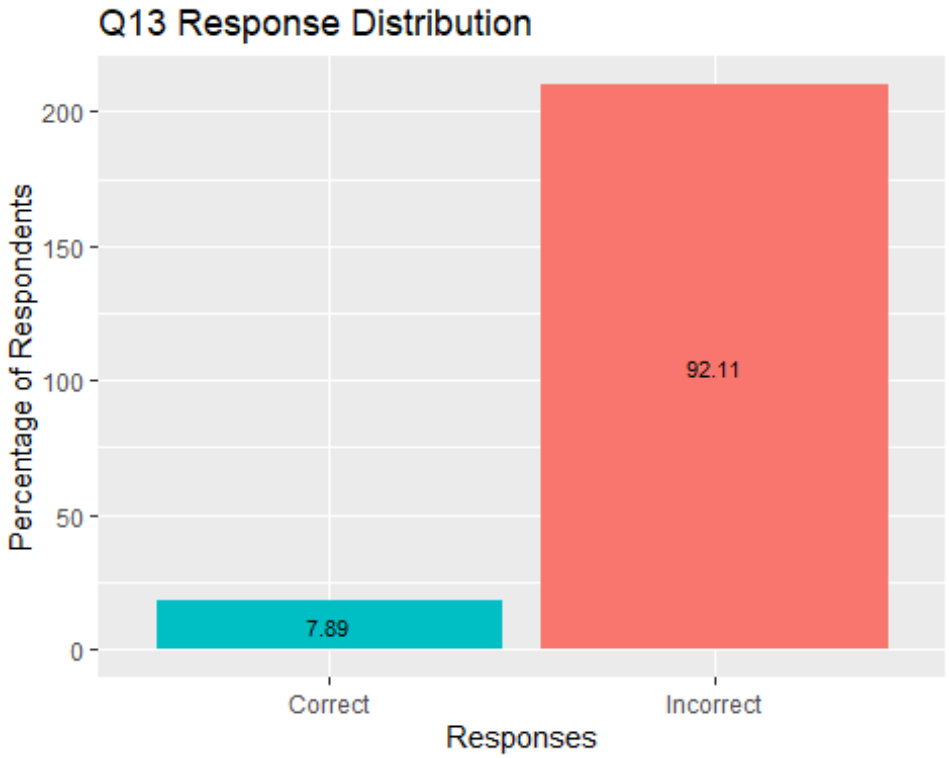


Figure 47. Response Distribution for AT Question 13 in Development Sample.

***Summary*:** The items we developed to assess analytical thinking in the serious game each have acceptable item parameters and good discriminability.

3.2.5 DR

3.2.5.1 Scale Information

The DR scale presents the player with a series of logic puzzles using logical operators. Items were analyzed using a two-parameter logistic IRT model.

Based on analyses in the minigame development sample, eleven items were retained. In the combined full sample, the final set showed good IRT marginal reliability, $r_{xx'} = .73$, IRT empirical reliability, $r_{xx'} = .75$, and α reliability, $\alpha = .74$. In the combined full sample, the 13 items have Fisher information > 2 (standard error < .71) between $z = -1.14$ and $z = 2.38$.

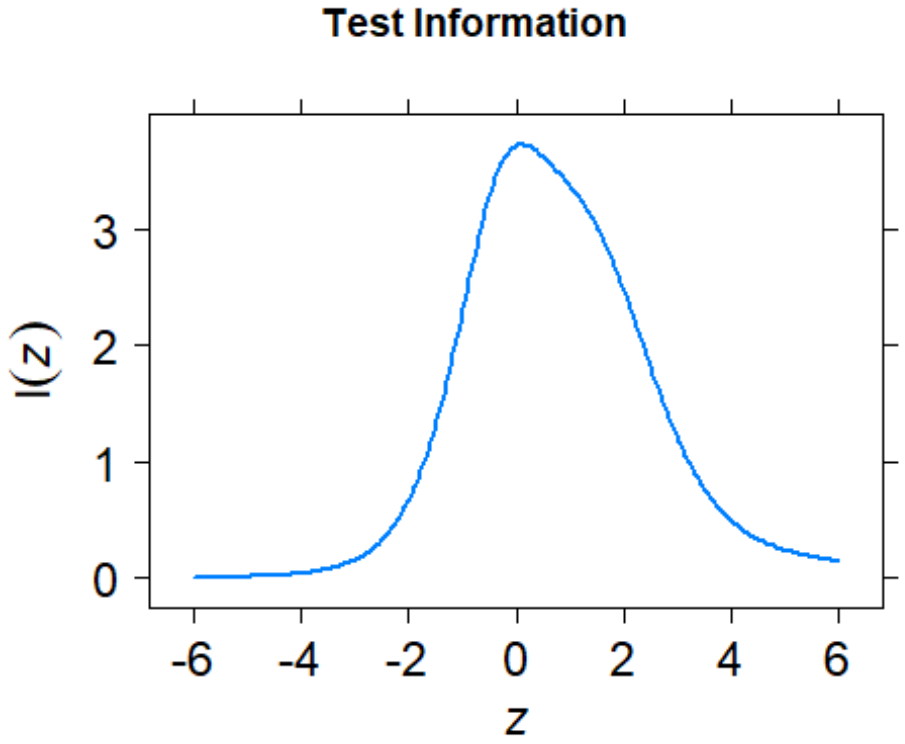


Figure 48. Test Information for DR Items in the Combined Full Sample.

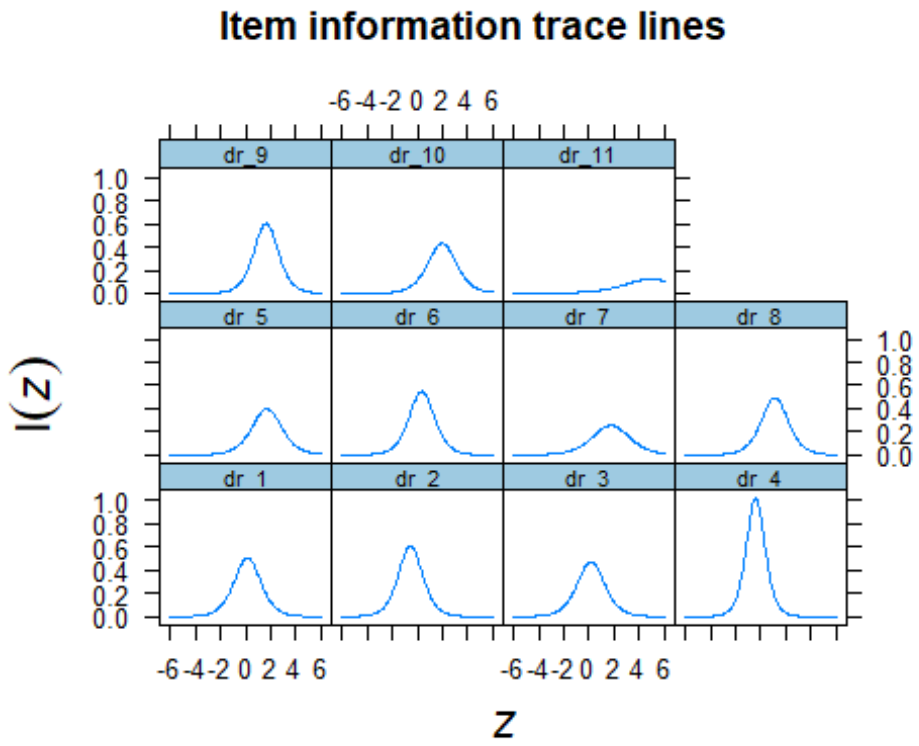


Figure 49. Item Trace Information for DR Items in the Combined Full Sample.

Below, each item is presented along with item statistics in the combined full sample and a graph showing the item's response distribution in the mini-game development sample. The correct answer for each item is listed under the item.

1. false OR (false _a._ true) = true

   a. OR

Table 28. Item Parameters for DR Question 1

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
1	393	0.46	0.50	0.03	0.71	1.42	0.13

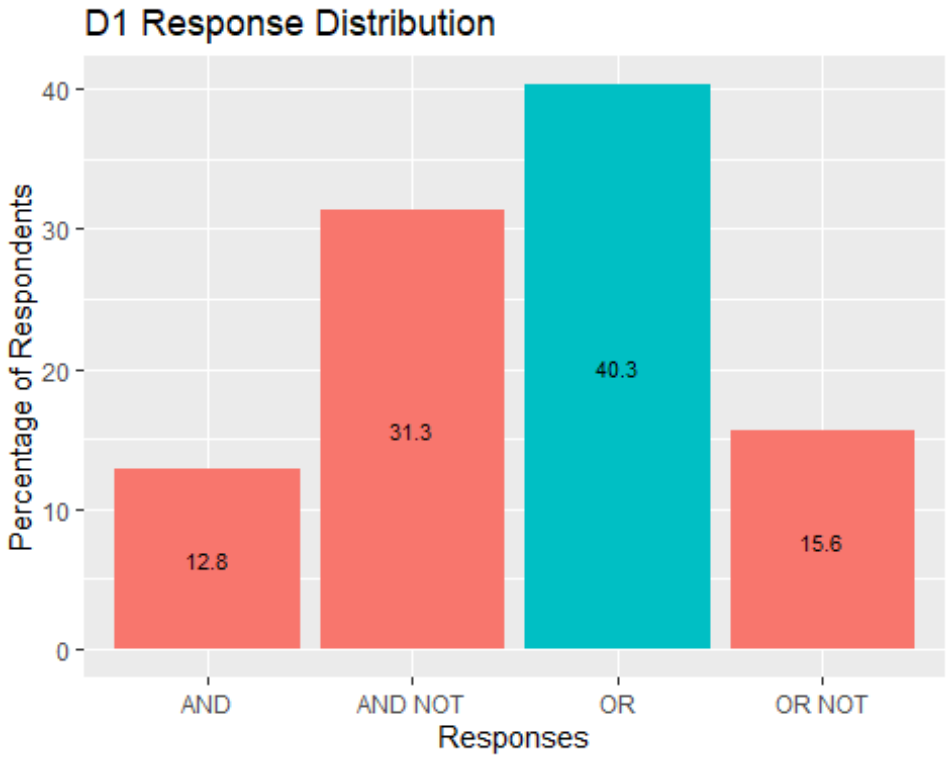


Figure 50. Response Distribution for DR Question 1 in Development Sample.

2. false AND (false OR true) = _a._

a. False

Table 29. Item Parameters for DR Question 2

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
2	393	0.64	0.48	0.02	0.72		-0.54

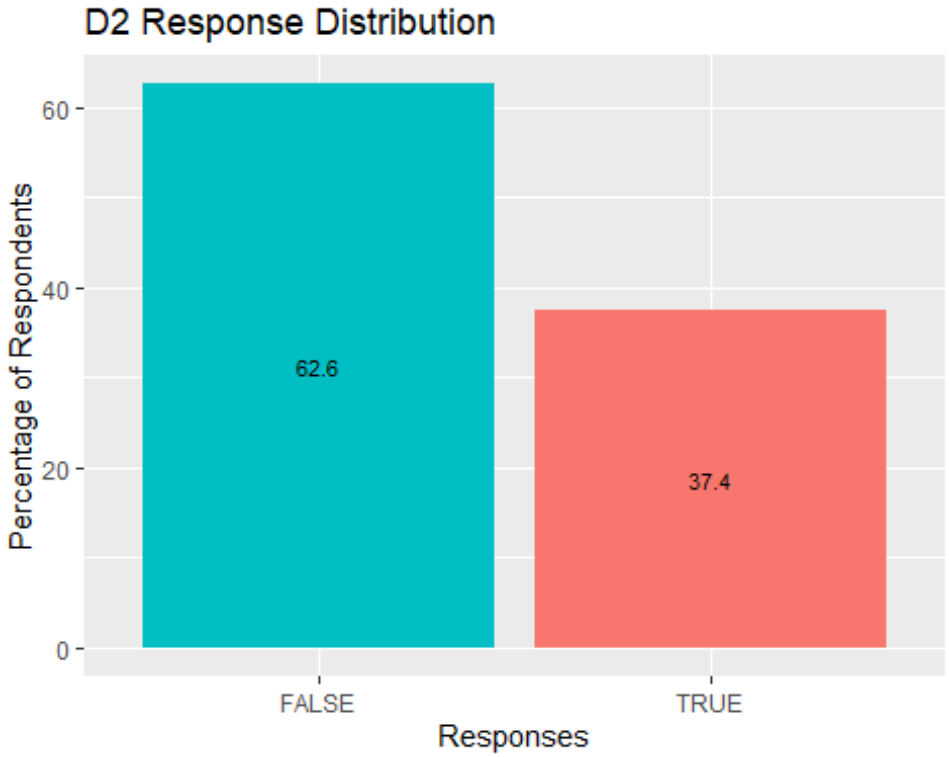


Figure 51. Response Distribution for DR Question 2 in Development Sample.

3. (false OR NOT true) AND true = a.

a. False

Table 30. Item Parameters for DR Question 3

		Classical Item Parameters					IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}		a	b
3	393	0.46	0.50	0.03	0.71		1.38	0.15

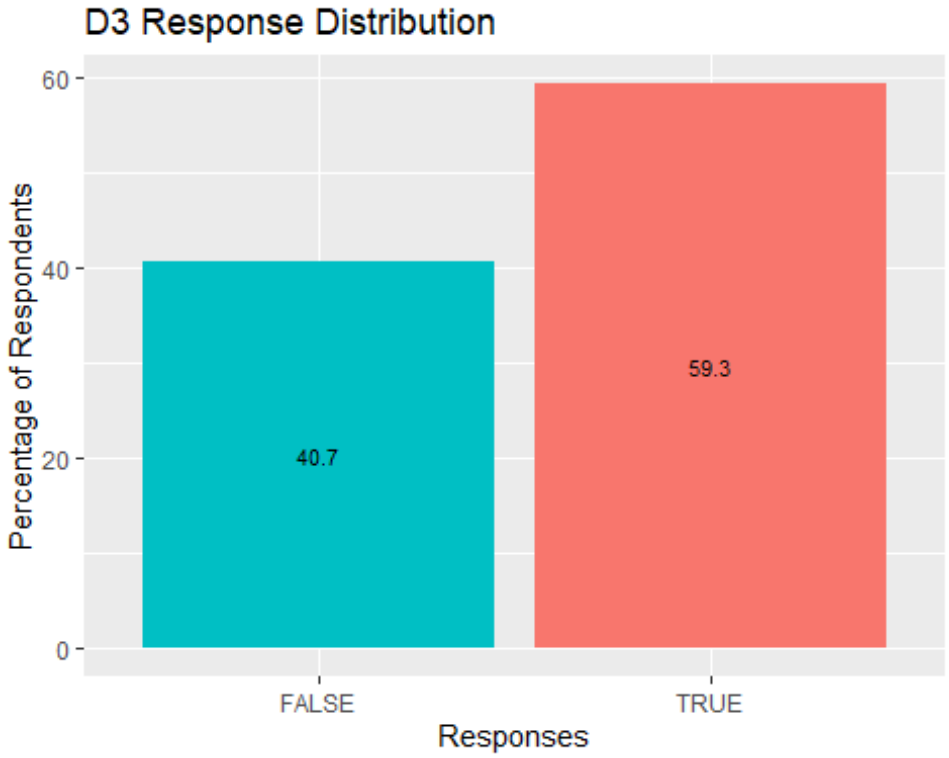


Figure 52. Response Distribution for DR Question 3 in Development Sample.

4. true AND (false OR _a._) = true

a. NOT false

Table 31. Item Parameters for DR Question 4

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
4	393	0.61	0.49	0.02	0.71	2.02	-0.39

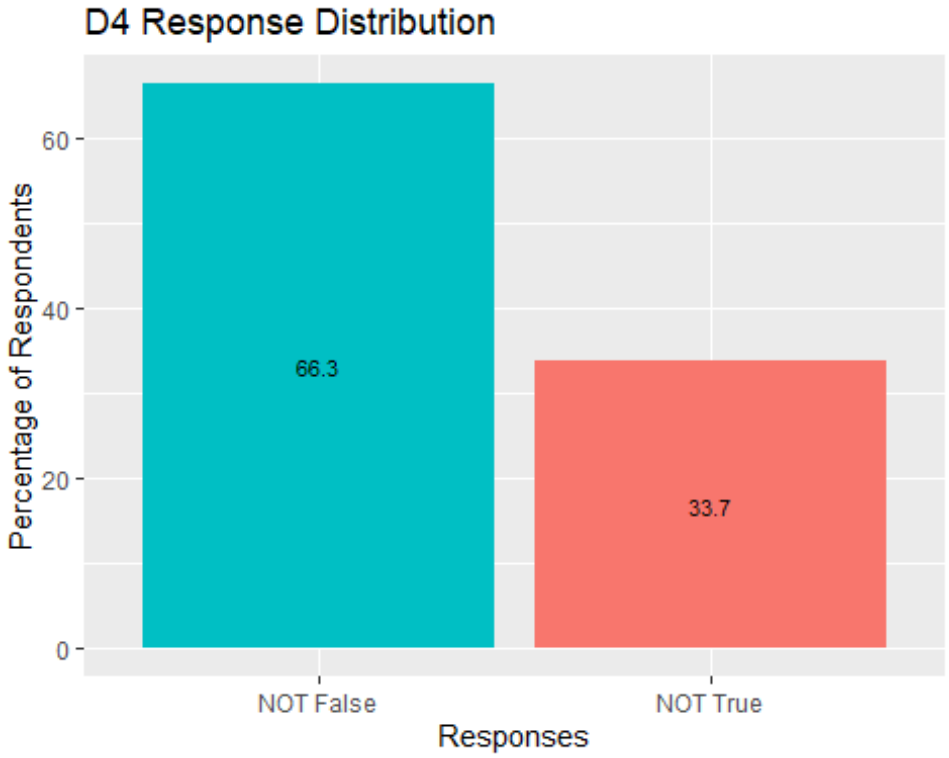


Figure 53. Response Distribution for DR Question 4 in Development Sample.

5. (a. OR NOT true) AND NOT [false OR (true b. false)] = true

a. True
b. AND

Table 32. Item Parameters for DR Question 5

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
5	393	0.16	0.37	0.02	0.72	1.26	1.67

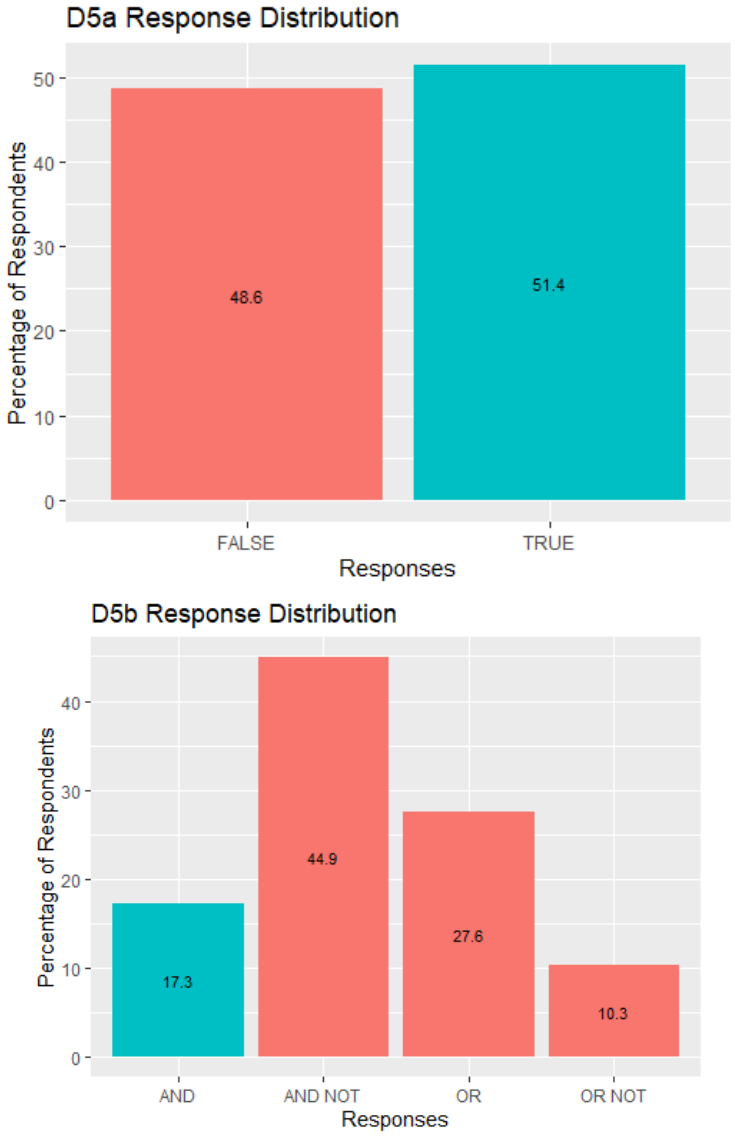


Figure 54. Response Distribution for DR Question 5 in Development Sample.

6. [true AND (_a._ OR NOT false)] _b._ NOT true = true

a. True/False both correct
b. OR

Table 33. Item Parameters for DR Question 6

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
6	393	0.40	0.49	0.02	0.71	1.48	0.36

Figure 55. Response Distribution for DR Question 6 in Development Sample.

7. __a.__ OR [(__b.__ AND true) OR NOT (true AND NOT __c.__)] = false

a. False
b. False
c. False

Table 34. Item Parameters for DR Question 7

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
7	393	0.19	0.39	0.02	0.73	1.01	1.74

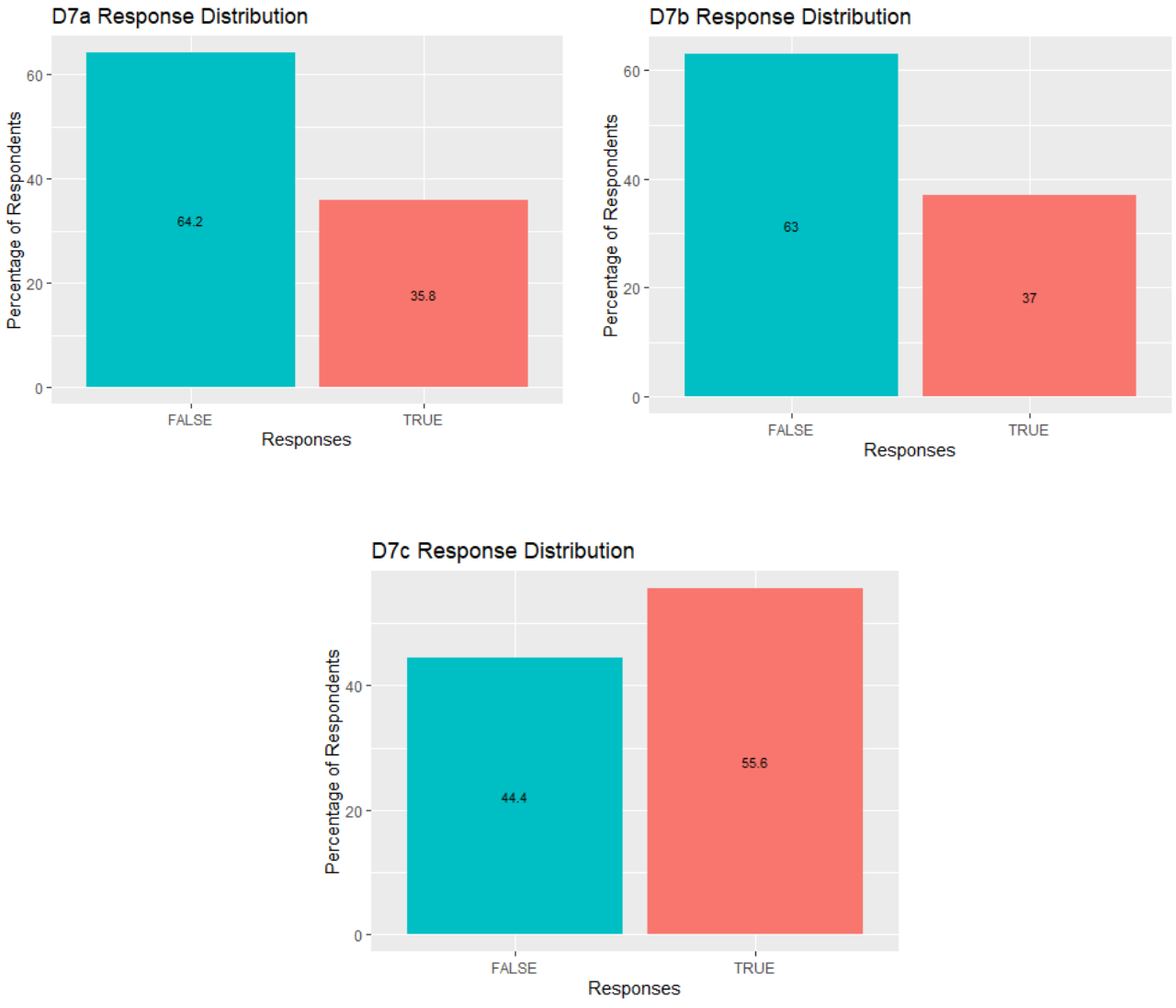


Figure 56. Response Distribution for DR Question 7 in Development Sample.

8. [(a. OR false) AND b.] AND NOT [false c. (true OR false)] = true

a. True
b. NOT false
c. AND

Table 35. Item Parameters for DR Question 8

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
8	393	0.23	0.42	0.02	0.71	1.40	1.13

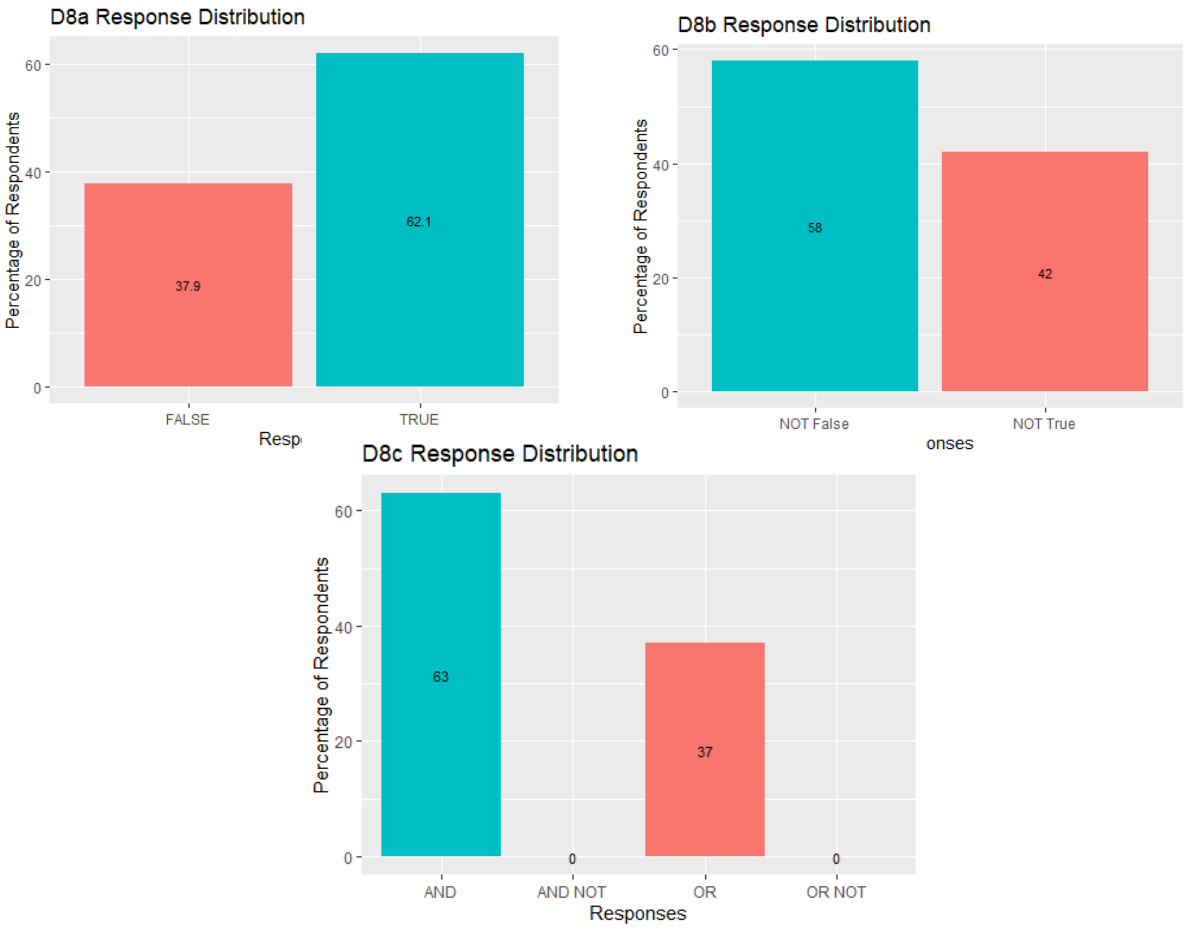


Figure 57. Response Distribution for DR Question 8 in Development Sample.

9. [(true AND _a._) OR (true AND NOT _b._)] OR NOT [(true AND _c._) AND (false _d._ true)] = false

a. False
b. True
c. NOT false
d. OR

Table 36. Item Parameters for DR Question 9

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
9	393	0.14	0.35	0.02	0.72	1.55	1.62

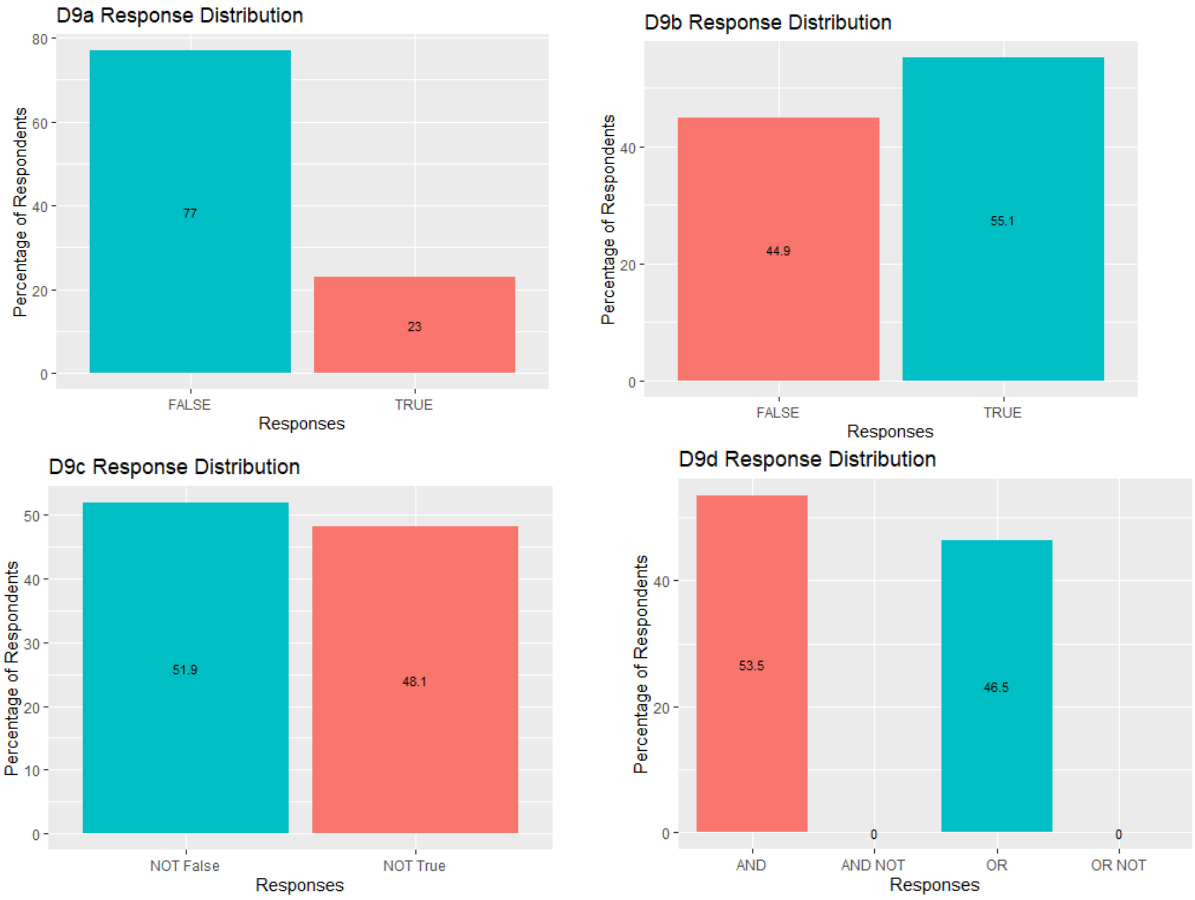


Figure 58. Response Distribution for DR Question 9 in Development Sample.

10. [(_a._ OR NOT true) _b._ false] AND [_c._ AND NOT (_d._ OR false)] = true

a. True
b. OR
c. True
d. False

Table 37. Item Parameters for DR Question 10

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
10	393	0.12	0.32	0.02	0.72	1.31	1.98

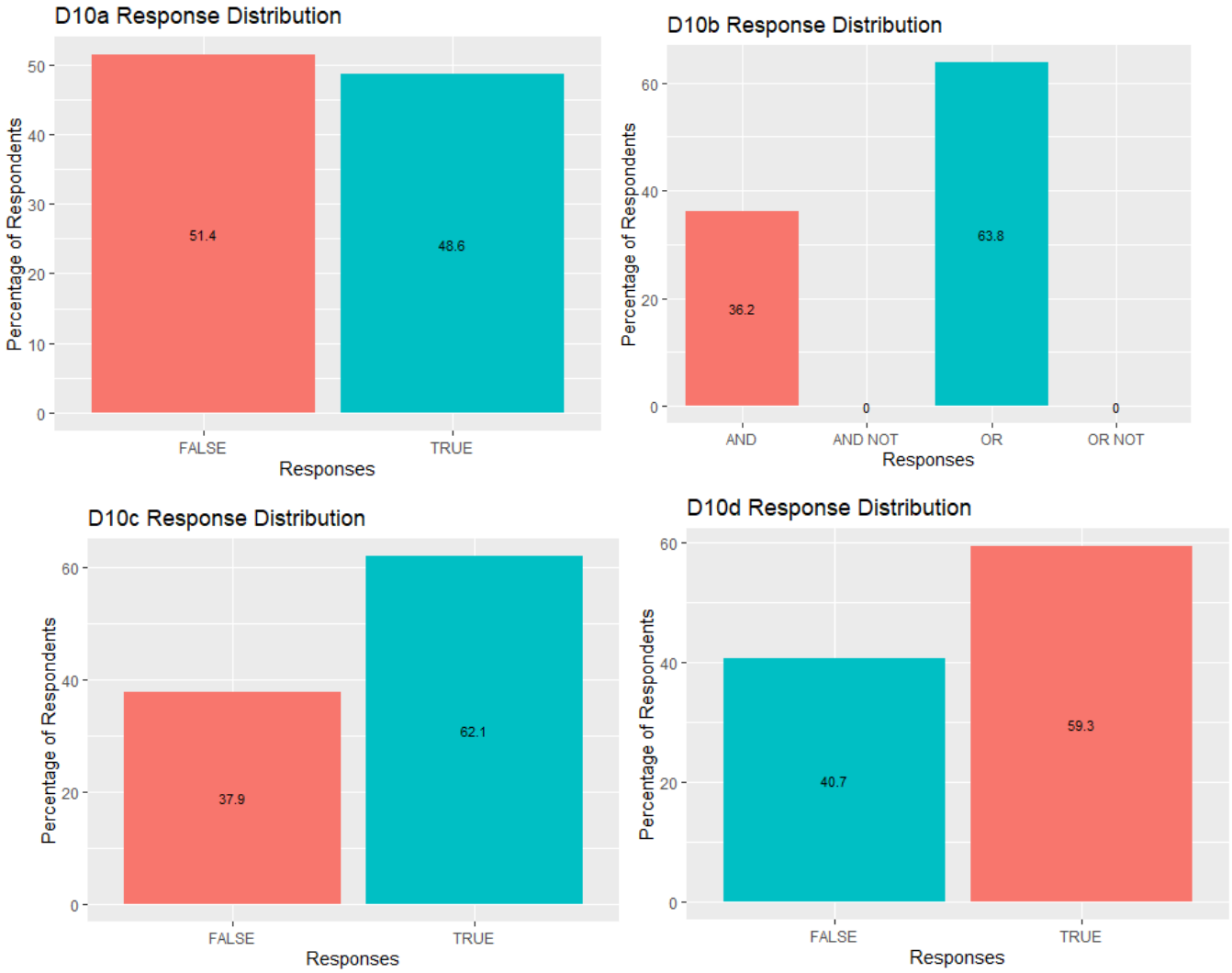


Figure 59. Response Distribution for DR Question 10 in Development Sample.

11. [(true _a._ NOT true) AND (_b._ OR NOT true)] AND NOT [(_c._ OR NOT false) _d._ false] = false

a. OR

b. True

c. False

d. OR NOT

Table 38. Item Parameters for DR Question 11

		Classical Item Parameters				IRT Parameters	
Item	N	Mean	SD	SE	α_{drop}	a	b
11	393	0.04	0.19	0.01	0.74	0.70	4.96

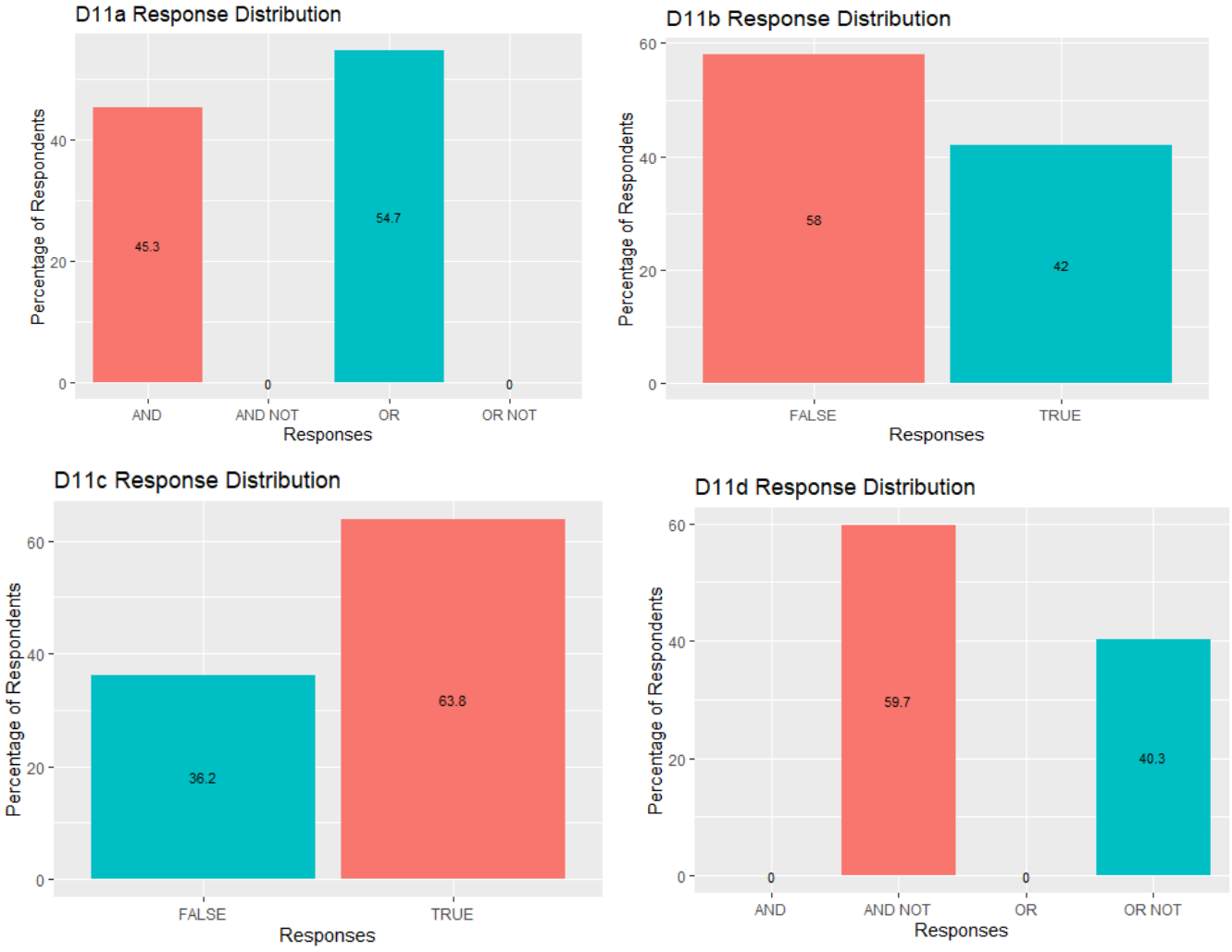


Figure 60. Response Distribution for DR Question 11 in Development Sample.

Summary: The items we developed to assess deductive reasoning in the serious game each have acceptable item parameters and good discriminability.

3.2.6 AL

3.2.6.1 Scale Information

The AL scale presents the player with a series of questions about preferences for intellectual challenge versus simple tasks. Items were adapted from those in the *need for cognition* scale described in Cacioppo and Petty (1982), with additional items written to capture the low end of this dimension (e.g., preference for simple, routine tasks). Items were scored on a five-point Likert scale and analysed using a graded response IRT model.

Based on analyses in the minigame development sample, eight items were retained. In the combined full sample, the final set showed good IRT marginal reliability, $r_{xx'} = .87$, IRT empirical reliability, $r_{xx'} = .87$, and α reliability, $\alpha = .86$. In the combined full sample, the 8 items have Fisher information > 2 (standard error < .71) between $z = -2.44$ and $z = 3.36$. and Fisher information > 2 (standard error < .50) between $z = -1.82$ and $z = 2.82$.

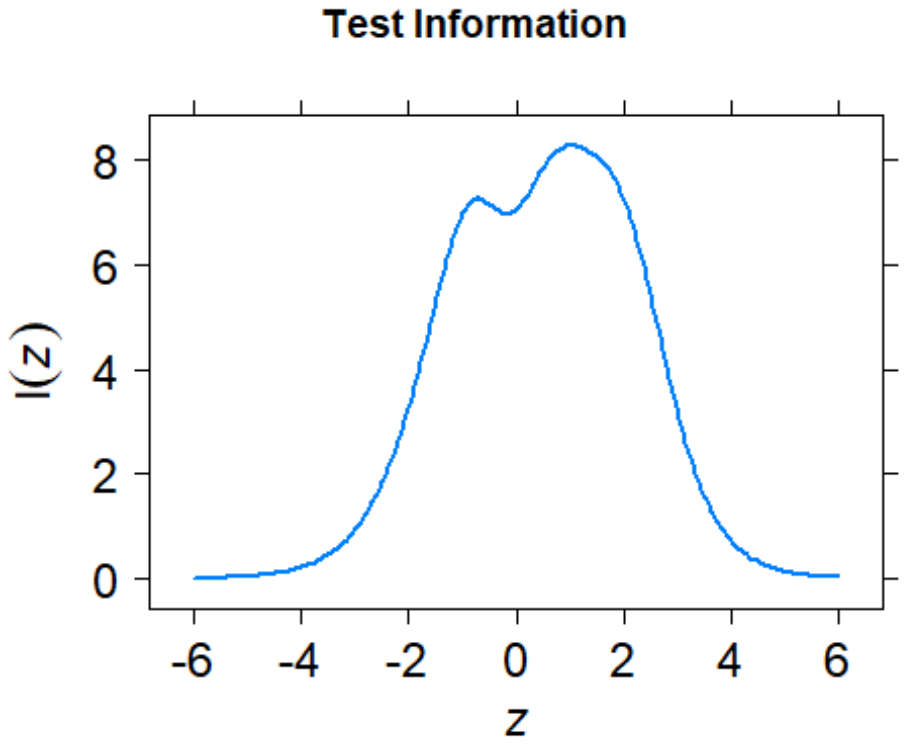


Figure 61. Test Information for AL Items in the Combined Full Sample.

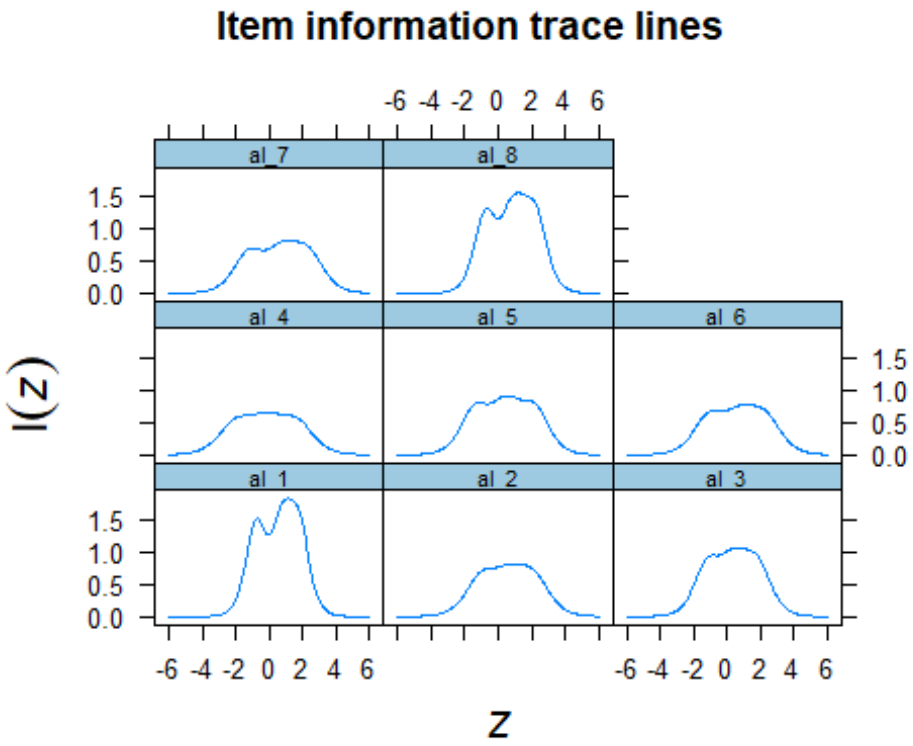


Figure 62. Item Information Trace Lines for AL Items in the Combined Full Sample.

Below, each item is presented along with item statistics in the combined full sample and a graph showing the item's response distribution in the mini-game development sample. All items are scored on a 1–5 Likert scale from Strongly Disagree to Strongly Agree.

1. I really enjoy a task that involves coming up with new solutions to a problem.

Table 39. Item Parameters for AL Question 1

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
1	351	3.70	1.19	0.06	0.83	2.42	-1.75	-1.09	-0.66	0.79

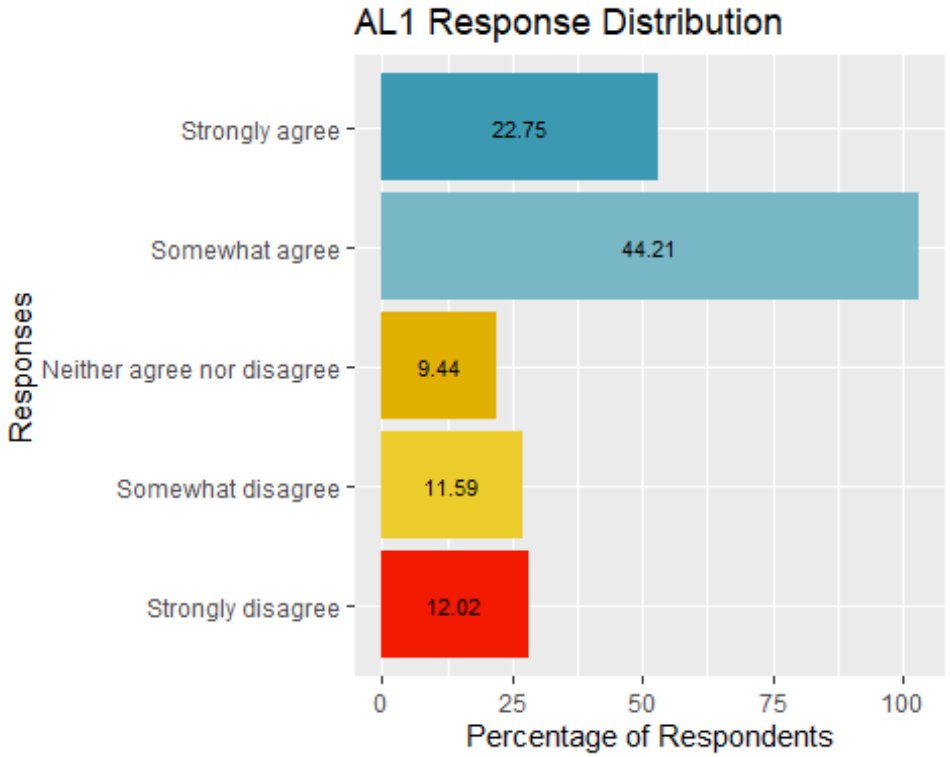


Figure 63. Response Distribution for AL Item 1 in Development Sample.

2. I prefer my life to be filled with puzzles that I must solve.

Table 40. Item Parameters for AL Question 2

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
2	393	3.60	1.21	0.06	0.85	1.62	-2.09	-1.10	-0.39	0.97

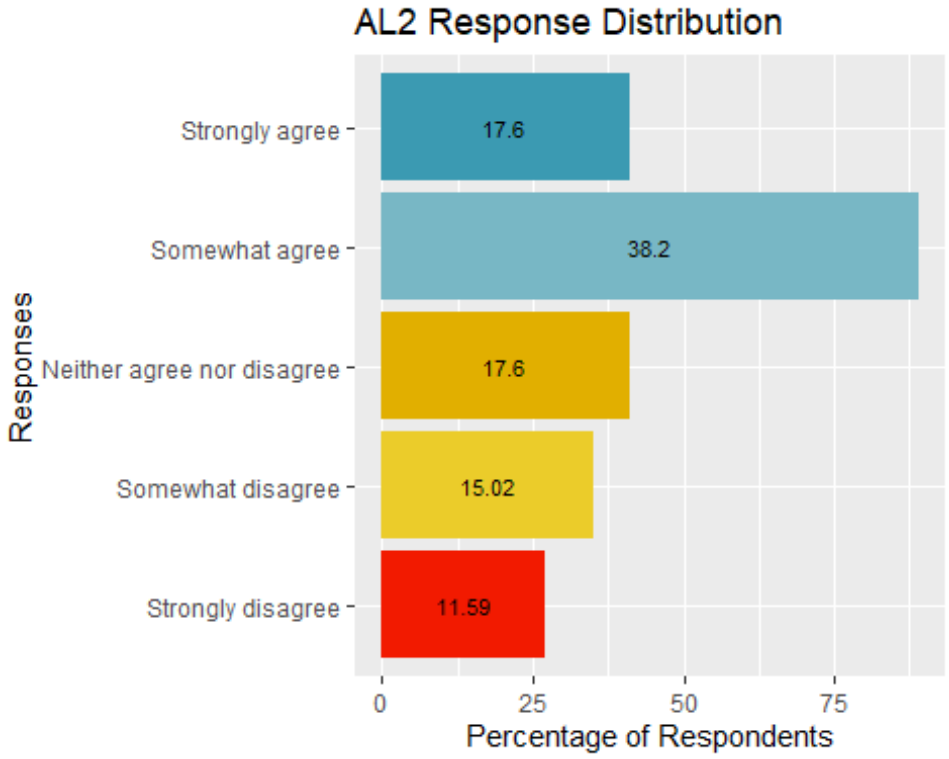


Figure 64. Response Distribution for AL Item 2 in Development Sample.

3. It's enough for me that something gets the job done; I don't care how or why it works.* (reverse scored)

Table 41. Item Parameters for AL Question 3

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
3	393	3.41	1.25	0.06	0.84	-1.85	1.11	-0.21	-0.83	-1.82

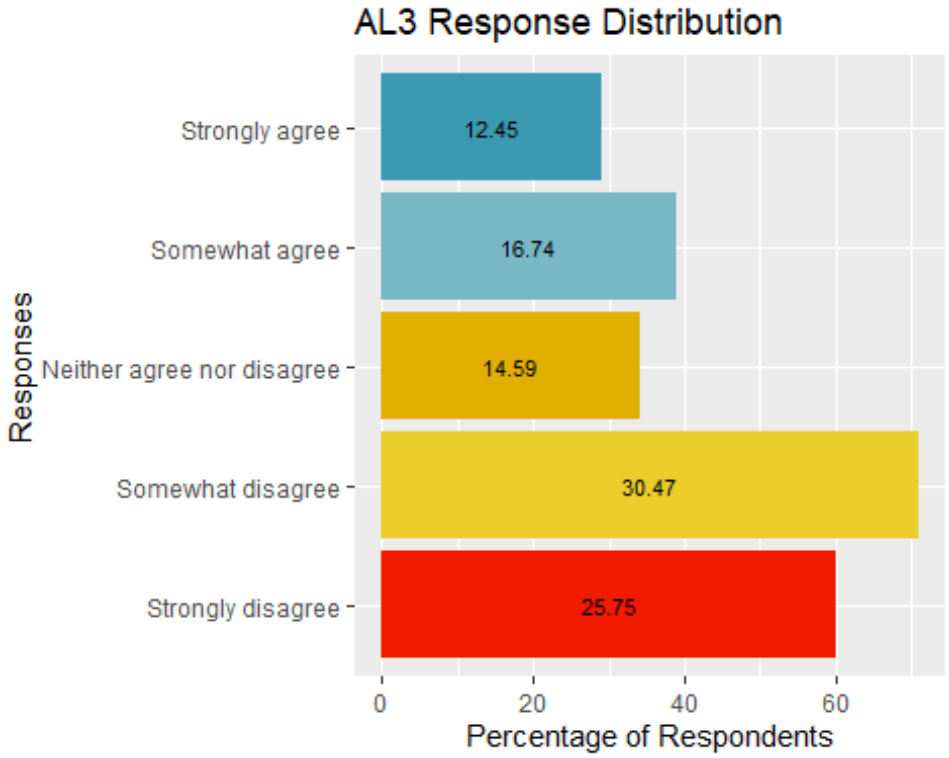


Figure 65. Response Distribution for AL Item 3 in Development Sample.

4. I like tasks that require little thought once I've learned them.* (reverse scored)

Table 42. Item Parameters for AL Question 4

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
4	392	2.83	1.25	0.06	0.85	-1.46	1.98	0.48	-0.13	-1.58

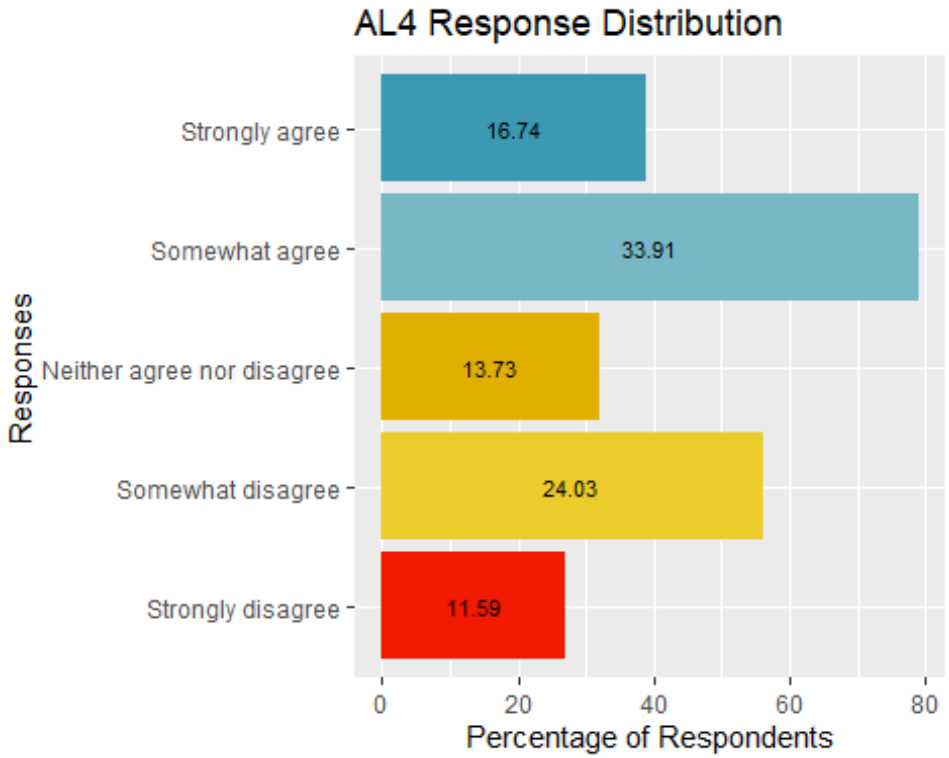


Figure 66. Response Distribution for AL Item 4 in Development Sample.

5. If I know something works, I don't worry too much about if there might be something better.* (reverse scored)

Table 43. Item Parameters for AL Question 5

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
5	391	3.37	1.18	0.06	0.84	-1.73	1.36	-0.19	-0.82	-2.15

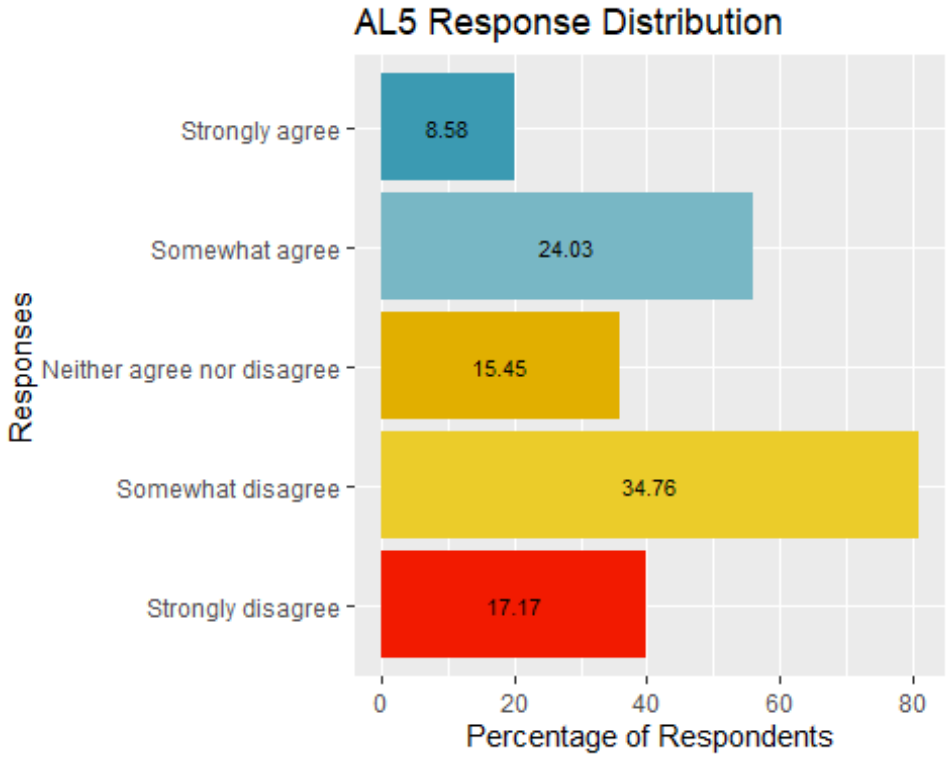


Figure 67. Response Distribution for AL Item 5 in Development Sample.

6. As long as I've met the requirements, I don't need to work harder to be the best.* (reverse scored)

Table 44. Item Parameters for AL Question 6

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
6	392	3.65	1.16	0.06	0.85	-1.58	1.04	-0.59	-1.25	-2.26

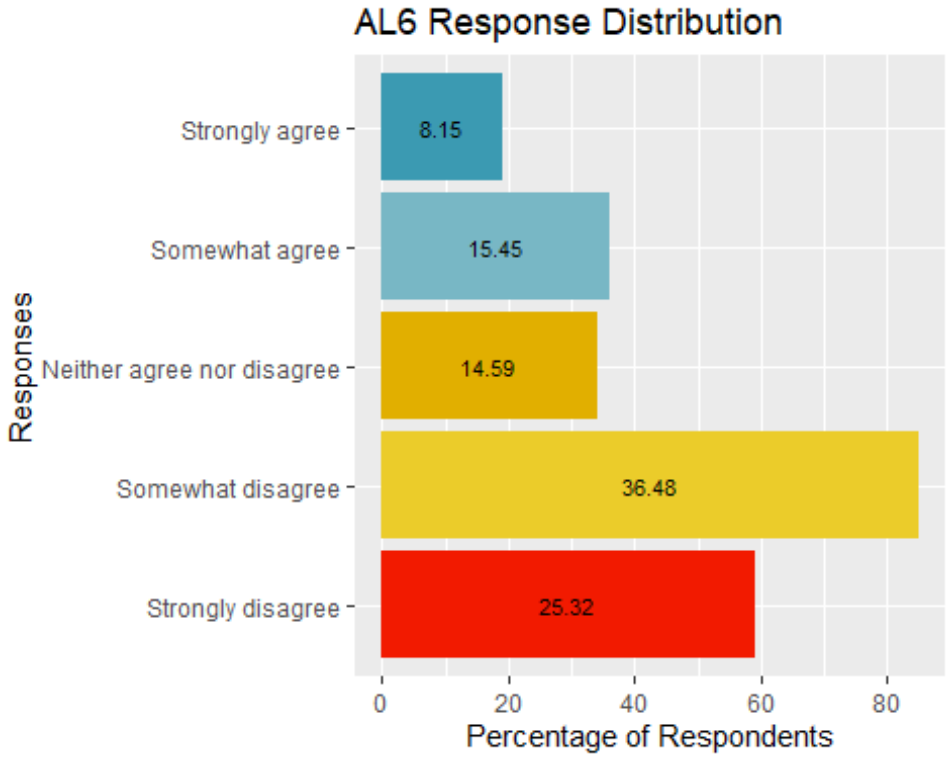


Figure 68. Response Distribution for AL Item 6 in Development Sample.

7. I like to dig into a system or machine and figure out how it works.

Table 45. Item Parameters for AL Question 7

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
7	393	3.60	1.13	0.06	0.84	1.62	-2.32	-1.21	-0.57	1.21

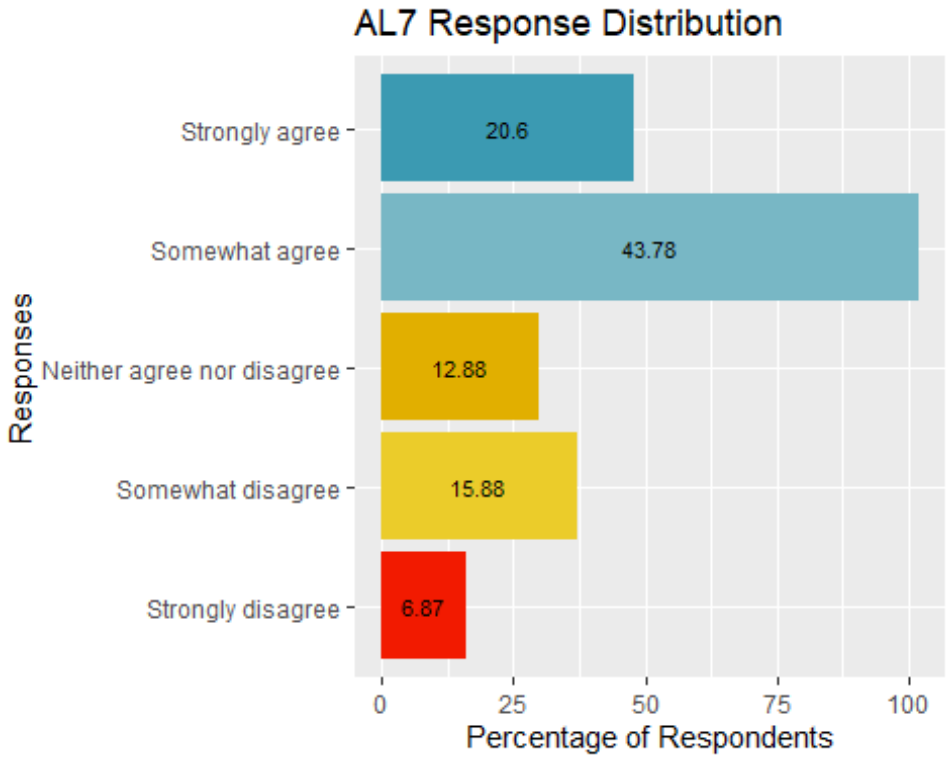


Figure 69. Response Distribution for AL Item 7 in Development Sample.

8. I like when my work is challenging me and tests my skills.

Table 46. Item Parameters for AL Question 8

		Classical Item Parameters				IRT Parameters				
Item	N	Mean	SD	SE	α_{drop}	a	b1	b2	b3	b4
8	393	3.84	1.06	0.05	0.83	2.25	-2.23	-1.38	-0.73	0.74

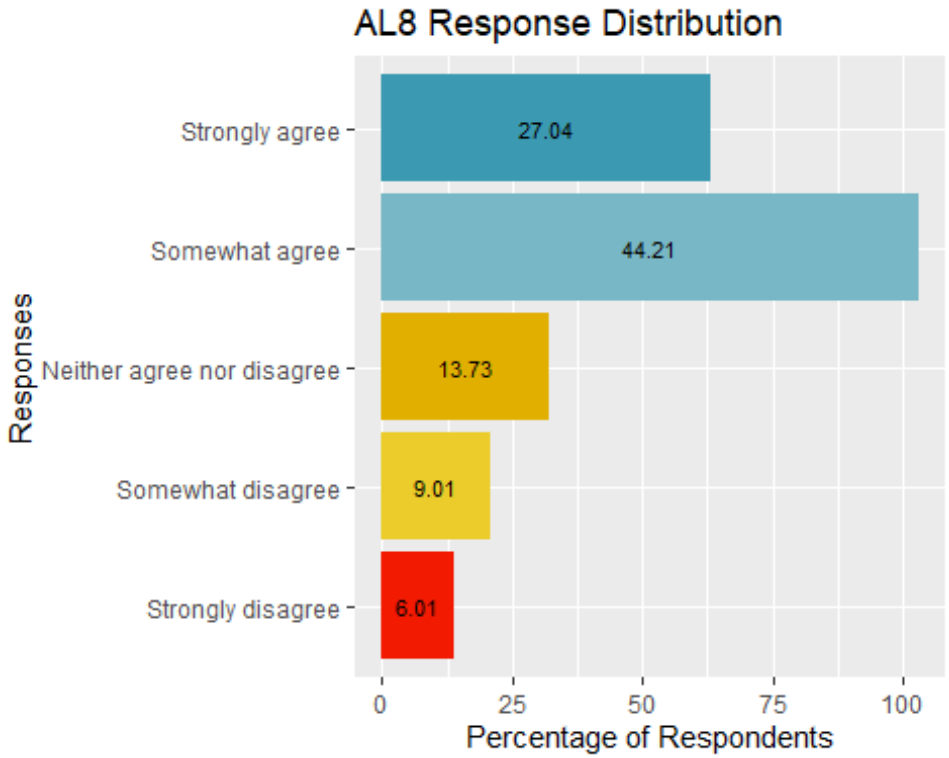


Figure 70. Response Distribution for AL Item 8 in Development Sample.

Summary: The items we retain to assess AL in the serious game each have acceptable item parameters and good discriminability.

3.3 SA, ST, and AD

3.3.1 Gameplay Metric Analysis

We now move to report results of item analyses of the gameplay metrics for Virus Slayer using data collected from MTurk workers. These metrics are used to score three constructs: SA, ST, and AD.

3.3.2 Basic Data Description

Gameplay is divided into three phases. Gameplay metrics for each phase are organized into three categories: - Variables for the phase overall - These can be selected using *select(!matches("c\\d$"))* - Variables for each clinic - These can be selected using

select(matches("c\\d$")) - SA questions asking about the game state (Phases 2 and 3 only) - These can be selected using *starts_with("sa") & contains("correctness")*

The data initially consist of 168 cases. Several cases (N = 12) provided no valid data for any phase. These were removed. This left N = 156 valid cases. There was a small amount of dropout as players moved through the phases (N = 7 missing for Phases 2 and 3; N = 9 missing for Phase Three; N = 140 provided full data for all phases). Missing data was handled using full-information maximum likelihood estimation.

3.3.3 ST

ST captures how well the player can learn how the game system works in order to accomplish game objectives. It is scored using a composite of several variables indicating effective gameplay. These variables are also used to estimate AD scores (see below).

The candidate indicators for these constructs are aveHelicLoad, aveTruckLoad, helicOver75Percent, truckOver75Percent, totalDispatches, propHelicoptersDispatched, deliveredAntivirals, deliveredFoodWater, failedAntivirals, failedFoodWater, phaseTwoInfect, phaseThreeInfect, deaths, cured, numStateDegr, numStateCrit.

Table 47. Correlations among Phase One Gameplay Metrics

	p1_aveHelicLoad	p1_aveTruckLoad	p1_helicOver75Percent	p1_truckOver75Percent	p1_totalDispatches	p1_propHelicoptersDispatched	p1_deliveredAntivirals	p1_deliveredFoodWater	p1_failedAntivirals	p1_failedFoodWatr	p1_phaseTwoInfect	p1_phaseThreeInfect	p1_deaths	p1_cured	p1_numStateDegr	p1_numStateCrit
p1_aveHelicLoad																
p1_aveTruckLoad	0.38															
p1_helicOver75Percent	-0.9	-0.42														
p1_truckOver75Percent	-0.34	-0.93	0.45													
p1_totalDispatches	-0.05	0.1	0.04	-0.01												
p1_propHelicoptersDispatched	0.17	-0.35	-0.12	0.33	-0.14											
p1_deliveredAntivirals	0.1	0.36	-0.13	-0.28	0.72	-0.29										
p1_deliveredFoodWatr	0.08	0.34	-0.12	-0.28	0.87	-0.33	0.66									
p1_failedAntivirals	0.11	0.22	-0.09	-0.19	0.37	-0.17	0.33	0.3								
p1_failedFodWater	0.18	0.37	-0.17	-0.3	0.53	-0.4	0.54	0.49	0.38							
p1_phaseTwoInfect	-0.16	-0.28	0.22	0.24	-0.68	0.13	-0.37	-0.76	-0.16	-0.32						
p1_phaseThreeInfect	-0.16	-0.27	0.22	0.25	-0.67	0.15	-0.36	-0.76	-0.14	-0.31	0.99					
p1_deaths	-0.01	-0.24	0.09	0.18	-0.39	0.09	-0.17	-0.42	0.08	-0.1	0.72	0.74				

p1_cured	0.08	0.28	-0.14	-0.23	0.55	-0.13	0.28	0.6	0.04	0.22	-0.88	-0.89	-0.95			
p1_numStateDegr	-0.03	-0.28	0.05	0.23	-0.66	0.35	-0.58	-0.78	-0.19	-0.36	0.51	0.51	0.21	-0.36		
p1_numStateCrit	-0.06	-0.25	0.11	0.21	-0.55	0.22	-0.27	-0.69	-0.1	-0.26	0.67	0.67	0.49	-0.6	0.62	

Table 48. Correlations among Phase Two Gameplay Metrics

	p2_aveHelicLoad	p2_aveTruckLoad	p2_helicOver75Percent	p2_truckOver75Percent	p2_totalDispatches	p2_propHelicoptersDispatched	p2_deliveredAntivirals	p2_deliveredFoodWater	p2_failedAntivirals	p2_failedFoodWater	p2_phaseTwoInfect	p2_phaseThreeInfect	p2_deaths	p2_cured	p2_numStateDegr	p2_numStateCrit
p2_aveHelicLoad																
p2_aveTruckLoad	0.58															
p2_helicOver75Percent	-0.95	-0.53														
p2_truckOver75Percent	-0.52	-0.95	0.52													
p2_totalDispatches	-0.27	-0.07	0.35	0.16												
p2_propHelicoptersDispatched	0.1	-0.14	-0.14	0.12	-0.21											
p2_deliveredAntivirals	0.08	0.29	-0.05	-0.21	0.58	-0.25										
p2_deliveredFoodWater	-0.04	0.22	0.13	-0.14	0.87	-0.39	0.51									
p2_failedAntivirals	0.29	0.43	-0.29	-0.4	0.16	-0.16	0.58	0.16								
p2_failedFodWater	0.38	0.48	-0.32	-0.44	0.33	-0.32	0.24	0.49	0.35							

p2_phaseTwoInfect	0.14	-0.12	-0.2	0.06	-0.83	0.28	-0.37	-0.91	-0.04	-0.42						
p2_phaseThreeInfect	0.13	-0.13	-0.19	0.07	-0.83	0.28	-0.35	-0.92	-0.04	-0.44	0.99					
p2_deaths	0.14	-0.22	-0.2	0.15	-0.47	0.15	-0.2	-0.44	-0.02	-0.21	0.58	0.57				
p2_cured	-0.16	0.18	0.21	-0.13	0.61	-0.19	0.3	0.63	0.04	0.26	-0.77	-0.76	-0.88			
p2_numStateDegr	0	-0.21	-0.1	0.14	-0.59	0.3	-0.51	-0.72	-0.19	-0.32	0.58	0.55	0.24	-0.42		
p2_numStateCrit	0.09	-0.13	-0.14	0.08	-0.58	0.2	-0.35	-0.63	-0.15	-0.24	0.62	0.61	0.55	-0.74	0.61	

Table 49. Correlations among Phase Three Gameplay Metrics

	p3_aveHelicLoad	p3_aveTruckLoad	p3_helicOver75Percent	p3_truckOver75Percent	p3_totalDispatches	p3_propHelicoptersDispatched	p3_deliveredAntivirals	p3_deliveredFoodWater	p3_failedAntivirals	p3_failedFoodWater	p3_phaseTwoInfect	p3_phaseThreeInfect	p3_deaths	p3_cured	p3_numStateDegr	p3_numStateCrit
p3_aveHelicLoad																
p3_aveTruckLoad	0.65															
p3_helicOver75Percent	-0.95	-0.63														
p3_truckOver75Percent	-0.6	-0.95	0.63													
p3_totalDispatches	-0.29	-0.09	0.35	0.2												
p3_propHelicoptersDispatched	0.02	-0.16	-0.05	0.12	-0.21											
p3_deliveredAntivirals	0.17	0.38	-0.15	-0.28	0.64	-0.34										

p3_deliveredFoodWater	0.05	0.29	0.01	-0.19	0.85	-0.39	0.7									
p3_failedAntivirals	0.39	0.6	-0.42	-0.57	0.21	-0.26	0.6	0.4								
p3_failedFoodWater	0.46	0.65	-0.42	-0.6	0.34	-0.34	0.51	0.65	0.58							
p3_phaseTwoInfect	-0.08	-0.26	0.06	0.19	-0.46	0.18	-0.49	-0.52	-0.29	-0.37						
p3_phaseThreeInfect	-0.08	-0.25	0.05	0.19	-0.45	0.19	-0.47	-0.51	-0.28	-0.36	1					
p3_deaths	-0.14	-0.31	0.11	0.24	-0.36	0.21	-0.47	-0.43	-0.26	-0.33	0.94	0.94				
p3_cured	0.01	0.29	0.04	-0.19	0.73	-0.32	0.69	0.81	0.37	0.54	-0.7	-0.68	-0.68			
p3_numStateDegr	-0.17	-0.31	0.13	0.25	-0.3	0.19	-0.5	-0.47	-0.28	-0.45	0.25	0.24	0.22	-0.36		
p3_numStateCrit	-0.01	-0.06	0	0	-0.47	0.15	-0.34	-0.5	-0.08	-0.32	0.34	0.34	0.29	-0.45	0.42	

As shown above, the phaseTwoInfect and phaseThreeInfect variables are near-collinear within a game phase, so we dropped phaseTwoInfect from further analyses.

Conceptually, the gameplay metrics can be grouped into six categories:

Table 50. Conceptual Mapping of ST Gameplay Metrics to Performance Categories

item	effic	activ	crit_state	death	hel_ use	rule_change
aveHelicLoad	1	0	0	0	0	0
aveTruckLoad	1	0	0	0	0	0
helicOver75Percent	0	0	0	0	0	-1
truckOver75Percent	0	0	0	0	0	-1
totalDispatches	0	1	0	0	0	0
propHelicoptersDispatched	0	0	0	0	1	0
deliveredAntivirals	0	1	0	0	0	0
deliveredFoodWater	0	1	0	0	0	0
failedAntivirals	0	0	0	0	0	-1
failedFoodWater	0	0	0	0	0	-1
phaseThreeInfect	0	0	0	1	0	0
deaths	0	0	0	1	0	0
cured	0	0	0	-1	0	0
numStateDegr	0	0	1	0	0	0
numStateCrit	0	0	1	0	0	0

1. Efficiency (*effic*) captures how efficiently playeres load vehicles— do they utilize vehicles' full capicity or do they waste space?
2. Activity (*activ*) captures players' overall activity level—how many vehicles do they dispatch and how many supplies are delivered?
3. Clinic Critical Status (*crit_state*) counts the number of clinics that are in degrading or critical status due to insufficient supplies or overcrowding.
4. Death (*death*) indexes players' overall achievement of the game objective and includes the number of patients reaching advanced stages of the infection, the number of patients dying, and the number of patients cured (reversed).
5. Helicopter Use (*hel_use*) captures the proportion of a player's dispatches that are helicopters (versus trucks). Helicopters move more quickly, but their capacity is much lower than trucks, so using them extensively is a suboptimal strategy (see the negative correlation between *propHelicoptersDispatched* and *deaths* in the correlation tables above).
6. Attentiveness to Rule Changes (*rule_change*) captures the degree to which players adjust their play strategies in Phases 2 and 3. In these phases, severe weather begins, leading trucks and helicopters to sometimes crash when loaded at >75% capacity. These metrics

count the number of times the player loads a vehicle over this capacity and the amount of supplies lost due to crashing (both reversed).

A parallel factor analysis of the Phase Two indicators suggests 2–4 factors.

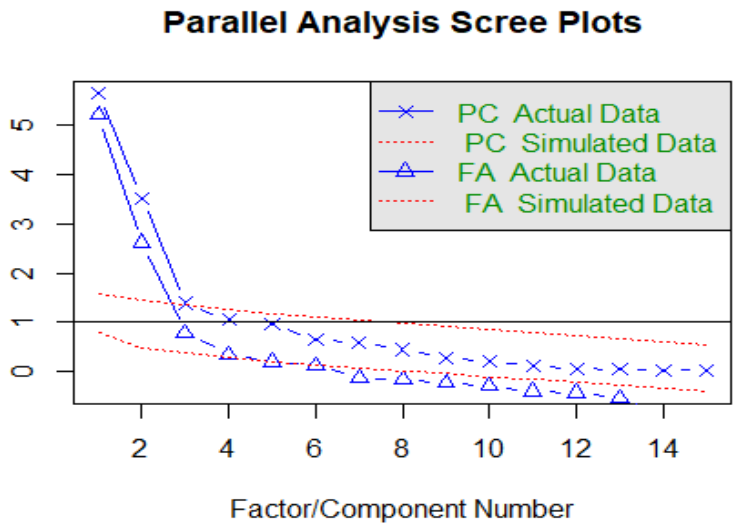


Figure 71. Parallel Analysis of ST Gameplay Metrics.

Table 51. Factor Loadings of ST Gameplay Metrics (2-Factor Solution)

item	MR1	MR2
p2_aveHelicLoad	-0.19	0.81
p2_aveTruckLoad	0.17	0.84
p2_helicOver75Percent	0.27	-0.78
p2_truckOver75Percent	-0.11	-0.80
p2_totalDispatches	0.88	-0.17
p2_propHelicoptersDispatched	-0.34	-0.06
p2_deliveredAntivirals	0.51	0.25
p2_deliveredFoodWater	0.92	0.09
p2_failedAntivirals	0.18	0.48
p2_failedFoodWater	0.40	0.51
p2_phaseThreeInfect	-0.90	0.03
p2_deaths	-0.63	0.01
p2_cured	0.80	-0.03
p2_numStateDegr	-0.67	-0.11
p2_numStateCrit	-0.74	-0.01

Table 52. Factor Loadings of ST Gameplay Metrics (4-Factor Solution)

item	MR1	MR4	MR3	MR2
p2_aveHelicLoad	0.03	0.06	0.02	0.93
p2_aveTruckLoad	0.00	0.90	-0.10	0.11
p2_helicOver75Percent	0.03	0.01	-0.02	-0.99
p2_truckOver75Percent	0.08	-0.93	0.09	-0.05
p2_totalDispatches	0.86	-0.21	-0.14	-0.07
p2_propHelicoptersDispatched	-0.34	-0.24	-0.08	0.23
p2_deliveredAntivirals	0.73	0.26	0.26	-0.07
p2_deliveredFoodWater	0.87	-0.02	-0.18	0.04
p2_failedAntivirals	0.42	0.44	0.34	0.04
p2_failedFoodWater	0.42	0.26	-0.05	0.27
p2_phaseThreeInfect	-0.63	0.11	0.45	-0.06
p2_deaths	-0.01	-0.18	0.80	0.11
p2_cured	0.16	0.08	-0.89	-0.05
p2_numStateDegr	-0.73	-0.06	-0.02	0.02
p2_numStateCrit	-0.45	-0.02	0.42	0.02

Note. Results for Phases 1 and 3 are similar.

Examining patterns of factor loadings for 2- and 4-factor solutions, indicators within the same category show strong loadings on the same factor. Accordingly, to reduce the number of variables to be modeled, we computed category composite scores by calculating z scores for each indicator in each phase and computing unit-weighted mean composites for the indicators in each category.

The *rule_change* variable is not meaningful for Phase 1 so it is omitted. To increase reliability, a single *hel_use* variable is computed across phases, rather than using the single indicator for each phase (correlations among these three indicators are r = 0.7, 0.57, 0.94).

Table 53. Correlations among ST Gameplay Metric Composites

	p1_effic	p1_activ	p1_crit_state	p1_death	p2_effic	p2_activ	p2_crit_state	p2_death	p2_rule_change	p3_effic	p3_activ	p3_crit_state	p3_death	p3_rule_change	hel_use
p1_effic															
p1_activ	0.21														
p1_crit_state	-0.21	-0.72													
p1_death	-0.23	-0.53	0.54												
p2_effic	0.6	0.04	-0.03	0											
p2_activ	0.2	0.92	-0.65	-0.49	0.06										
p2_crit_state	-0.06	-0.66	0.55	0.34	-0.09	-0.72									
p2_death	-0.19	-0.65	0.67	0.81	-0.05	-0.68	0.65								
p2_rule_change	0.18	-0.38	0.23	0.2	0.37	-0.52	0.31	0.33							
p3_effic	0.46	0.06	-0.01	0.01	0.95	0.09	-0.13	-0.05	0.32						
p3_activ	0.2	0.8	-0.61	-0.48	0.09	0.93	-0.74	-0.7	-0.52	0.11					
p3_crit_state	-0.18	-0.35	0.28	0.18	-0.17	-0.43	0.48	0.32	0.22	-0.18	-0.58				
p3_death	-0.28	-0.53	0.46	0.48	-0.24	-0.6	0.59	0.68	0.31	-0.22	-0.67	0.42			
p3_rule_change	0.04	-0.48	0.31	0.34	0.29	-0.59	0.45	0.5	0.76	0.28	-0.67	0.31	0.41		
hel_use	-0.19	-0.33	0.31	0.2	-0.04	-0.35	0.31	0.29	0.29	-0.04	-0.34	0.2	0.26	0.31	

Several patterns are notable in the correlations among gameplay metrics. First, composite scores for the same category tend to be highly-correlated across gameplay phases. Second, the *rule_change* variable does not function well. High scores on *rule_change* reflect greater attentiveness to severe weather and vehicle crashes in Phases 2 and 3 and corresponding reductions in vehicle capacity used to avoid crashes. However, *rule_change* was *negatively* correlated with *death*—meaning that responding to vehicle crashes tended to result in *more* patient deaths. This indicates reducing load capacity of vehicles below 75% was a suboptimal strategy. It may be the crash rates were too low for them to fundamentally change the optimal strategy. Based on these results, we dropped *rule_change* from further analyses.

Parallel analysis of the remaining 13 variables suggests 1 strong factor, with potentially a weaker second factor.

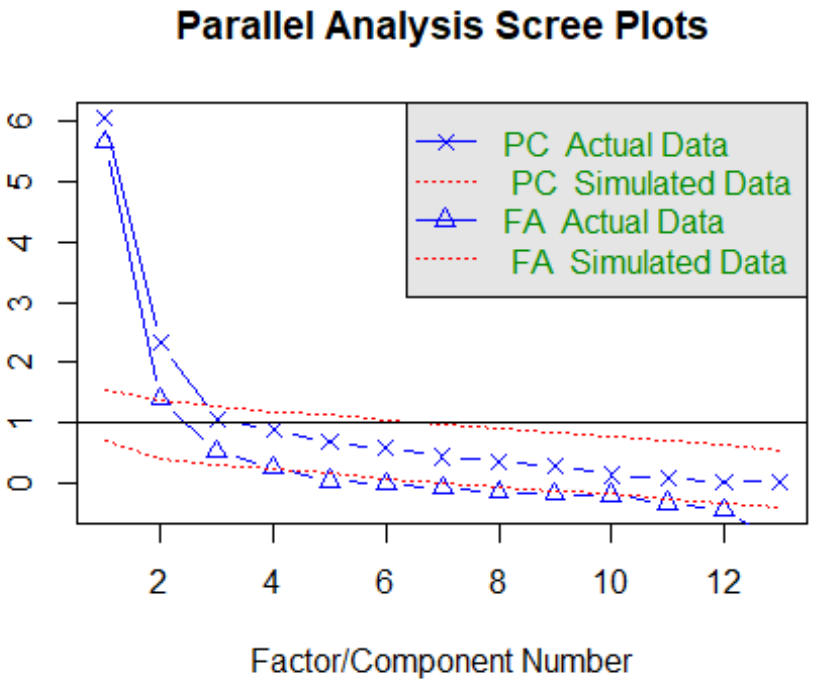


Figure 72. Parallel Analysis of ST Gameplay Metric Composites.

Table 54. Factor Loadings of ST Gameplay Metric Composites (1-Factor Solution)

item	MR1
p1_effic	-0.28
p1_activ	-0.86
p1_crit_state	0.73
p1_death	0.62
p2_effic	-0.16
p2_activ	-0.91
p2_crit_state	0.77
p2_death	0.83
p3_effic	-0.16
p3_activ	-0.92
p3_crit_state	0.49
p3_death	0.73
hel_use	0.38
p1_effic	-0.28
p1_activ	-0.86

Table 55. Factor Loadings of ST Gameplay Metrics (2-Factor Solution)

item	MR1	MR2
p1_effic	-0.18	0.53
p1_activ	-0.87	-0.04
p1_crit_state	0.74	0.05
p1_death	0.63	0.05
p2_effic	0.02	1.02
p2_activ	-0.92	-0.02
p2_crit_state	0.77	-0.02
p2_death	0.84	0.03
p3_effic	0.00	0.91
p3_activ	-0.91	0.02
p3_crit_state	0.46	-0.14
p3_death	0.69	-0.18
hel_use	0.38	-0.03
p1_effic	-0.18	0.53
p1_activ	-0.87	-0.04

Examining loadings for the 2-factor solution shows it reflects only the *effic* variables. Accordingly, a 1-factor solution was retained.

The resulting composite score of these variables had high reliability (ω = 0.9; α = 0.89). Estimated factor scores and unit-weighted scores correlated $r = 0.96$. In computing the composites, indicator were keyed so that higher scores indicated better performance (e.g., fewer deaths).

3.3.4 AD

AD captures how well the player can respond to changing conditions. Through the three phases of gameplay, the game becomes increasingly difficult. Additional clinics come into play, and severe weather causes vehicles to crash when overloaded. The AD gameplay metrics capture how well the player responds to this increased difficulty and maintains or improves their performance relative to Phase 1.

Our scoring approach for AD is to regress the performance category scores for Phases 2 and 3 onto the performance category scores for Phase One. The residuals from these regression models reflect a player's improvement or decline in Phase 2 and 3 performance, relative to the level expected based on their Phase One performance.

We estimated the regression models as follows:

$$\boldsymbol{\beta}_{\mathbf{Z}_{23}} = (\mathbf{Z}_1{}'\mathbf{Z}_1)^{-1}\mathbf{Z}_1{}'\mathbf{Z}_{23}$$

$$\boldsymbol{\epsilon}_{23} = \mathbf{Z}_{23} - \mathbf{Z}_{23}\boldsymbol{\beta}_{\mathbf{Z}_{23}}$$

Here, $\boldsymbol{\beta}_{\mathbf{Z}_{23}}$ are the standardized regression coefficients for predicting each Phase Two and 3 variable using the Phase One variables, $\mathbf{Z}_1$ are the z-scores for the Phase One variables, $\mathbf{Z}_{23}$ are the z-scores for the Phase 2 and 3 variables, and $\boldsymbol{\epsilon}_{23}$ are the residual scores for the Phase 2 and 3 variables after accounting for the Phase One variables.

Note: We included *hel_use* as a Phase One predictor in the regression models.

The resulting regression coefficients are shown below.

Table 56. Regression Coefficients for Predicting Phase Two and 3 ST Gameplay Metric Composites Using Phase One Values

	p2_ effic	p2_ activ	p2_crit _state	p2_ death	p3_ effic	p3_ activ	p3_crit _state	p3_d eath
beta_p1_effic	0.64	0.00	0.10	0.04	0.49	0.01	-0.10	-0.13
beta_p1_activ	0.01	0.93	-0.55	-0.17	0.10	0.72	-0.29	-0.31
beta_p1_crit_s tate	0.02	0.04	0.15	0.21	0.08	-0.03	0.04	0.06
beta_p1_death	0.14	-0.01	-0.03	0.60	0.12	-0.06	-0.04	0.24
beta_hel_use	0.06	-0.06	0.11	0.05	0.04	-0.08	0.08	0.06

Note: As an alternative approach, we also attempted to fit confirmatory and exploratory bifactor models, specifying all 13 indicators to load onto one general factor (reflecting “ST”) and the eight Phase 2 and Phase 3indicators to also load onto an independent group factor (reflecting "AD”). We also fit bifactor models specifying the Phase Two and Phase Three indicator to load onto two separate correlated group factors. As discussed above, scores for each performance category were highly correlated across phases. As a result, these bifactor models showed poor fit and uninterpretable factor loading estimates.

We then used these regression coefficients to compute Phase Two and Phase Three residual performance scores.

Table 57. Correlations Among Phase Two and 3 Residual Performance Scores

	p2_effic	p2_ activ	p2_crit _state	p2_ death	p3_ effic	p3_ activ	p3_crit _state
p2_effic							
p2_activ	0.09						
p2_crit_stat e	-0.21	-0.39					
p2_death	-0.16	-0.41	0.54				
p3_effic	0.94	0.09	-0.2	-0.13			
p3_activ	0.1	0.82	-0.47	-0.46	0.11		
p3_crit_stat e	-0.12	-0.29	0.36	0.21	-0.13	-0.53	
p3_death	-0.22	-0.35	0.42	0.51	-0.2	-0.46	0.3

Parallel analysis of these eight residualized variables suggests one strong factor, with potentially a weaker second factor.

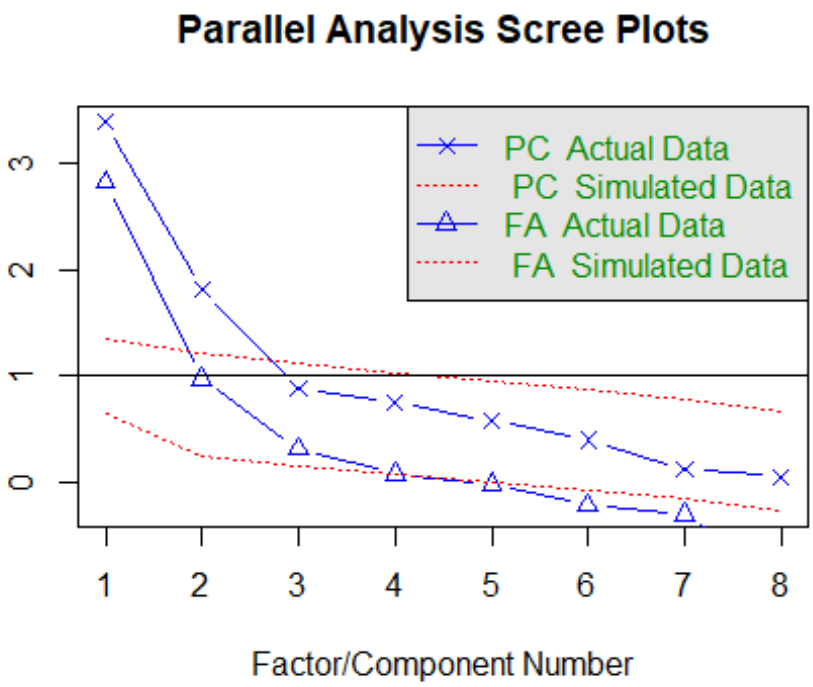


Figure 73. Parallel Analysis of Phase 2 and 3 Residual Performance Scores.

Table 58. Factor Loadings of Phase 2 and 3 Residual Performance Scores (1-Factor Solution)

item	MR1
p2_effic	-0.32
p2_activ	-0.69
p2_crit_state	0.65
p2_death	0.63
p3_effic	-0.31
p3_activ	-0.84
p3_crit_state	0.49
p3_death	0.61

Table 59. Factor Loadings of Phase 2 and 3 Residual Performance Scores (2-Factor Solution)

item	MR1	MR2
p2_effic	0.00	1.00
p2_activ	-0.75	-0.05
p2_crit_state	0.60	-0.13
p2_death	0.60	-0.07
p3_effic	0.00	0.94
p3_activ	-0.93	-0.06
p3_crit_state	0.48	-0.05
p3_death	0.56	-0.14

Examining loadings for the 2-factor solution again shows it reflects only the *effic* variables. Accordingly, a 1-factor solution was retained.

The resulting composite score of these variables had high reliability ($\omega = 0.8$; $\alpha = 0.8$). Estimated factor scores and unit-weighted scores correlated $r = 0.91$.

3.3.5 SA

SA captures how aware the player is of their game environment. It is scored using two types of indicators. First, in Phases 2 and 3, a popup prompt asks six questions about the game state and rules. Second, several gameplay metrics reflecting the construct are scored.

SA Popup Questions: **S**everal items perform poorly. Three items show no variance; no players answered them correctly. These were dropped from analyses.

Table 60. Proportion of Players Answering Each SA Popup Item Correctly

item	Prop. correct
sa_p2_insuf_watr	0.56
sa_p2_insuf_food	0.50
sa_p2_insuf_antv	0.52
sa_p2_quick_antv	0.15
sa_p2_quick_watr	0.39
sa_p2_quick_food	0.00
sa_p3_insuf_watr	0.04
sa_p3_quick_antv	0.31
sa_p3_insuf_food	0.01
sa_p3_quick_watr	0.00
sa_p3_insuf_antv	0.08
sa_p3_quick_food	0.00

We then fit a 2-parameter logistic IRT model to the remaining items. We found that, although there was good overall model fit, the items assessing awareness of the game's resource consumption parameters (labelled *quick*) showed poor discrimination in either a 1-factor or 2-factor solution. Accordingly, these were dropped.

Table 61. IRT Parameters for SA Popup Items — 1-Factor Model

item	a	b
sa_p2_insuf_watr	0.78	-0.34
sa_p2_insuf_food	3.46	-0.02
sa_p2_insuf_antv	0.76	-0.10
sa_p2_quick_antv	-0.38	-4.64
sa_p2_quick_watr	0.04	11.77
sa_p3_insuf_watr	1.14	3.18
sa_p3_quick_antv	0.01	100.11
sa_p3_insuf_food	0.63	6.80
sa_p3_insuf_antv	1.23	2.45

Table 62. IRT Parameters for SA Popup Items — 2-Factor Model

item	a1	a2	d
sa_p2_insuf_watr	0.79	0.00	0.26
sa_p2_insuf_food	1.98	0.00	0.02
sa_p2_insuf_antv	0.86	0.00	0.08
sa_p2_quick_antv	0.00	0.68	-1.85
sa_p2_quick_watr	0.00	0.47	-0.47
sa_p3_insuf_watr	1.38	0.00	-3.84
sa_p3_quick_antv	0.00	1.52	-1.11
sa_p3_insuf_food	0.87	0.00	-4.45
sa_p3_insuf_antv	1.69	0.00	-3.41

We then fit a new IRT model including just the retained six items.

Table 63. IRT Parameters for Retained SA Popup Items

item	a	b
sa_p2_insuf_watr	0.76	-0.34
sa_p2_insuf_food	2.78	-0.02
sa_p2_insuf_antv	0.79	-0.10
sa_p3_insuf_watr	1.26	2.97
sa_p3_insuf_food	0.78	5.63
sa_p3_insuf_antv	1.39	2.27

Table 64. IRT Parameters for Retained SA Popup Items — Rasch Model

item	a	b
sa_p2_insuf_watr	1	-0.30
sa_p2_insuf_food	1	-0.03
sa_p2_insuf_antv	1	-0.09
sa_p3_insuf_watr	1	3.61
sa_p3_insuf_food	1	4.70
sa_p3_insuf_antv	1	2.92

The final model contained six items assessing awareness of the resource status of the clinics. The estimate theoretical marginal reliability for the scores is $r_{xx'} = 0.55$. The estimated empirical reliability of the estimated factor scores is $r_{xx'} = 0.66$.

For comparison, the estimate theoretical marginal reliability for scores estimated using a 1-parameter logistic (Rasch) model is $r_{xx'} = 0.42$. The estimated empirical reliability for Rasch-estimated factor scores is $r_{xx'} = 0.51$.

Note: We also fit a 3-parameter model with a fixed lower asymptote based on the number of response options (true guessing parameter); the additional complexity did not improve model fit, so we retained the simpler 2-parameter model.

The estimated factor scores from the 2-parameter logistic model were combined with behavioral SA indicators observed in gameplay to obtain the final SA scores.

3.3.5.1 Behavioral SA Indicators

There are two types of behavioral SA indicators:

1. Player's exploration/search behavior
   - How frequently do players view the status of a clinic and how quickly do they respond to alerts of status changes?
2. Player's responsiveness to clinic deficiencies
   - How long do clinics remain with insufficient food/water/antivirals?

The behavioral SA indicators are aveAveTimeNotViewed, aveAveTimeViewed, aveTimeAlertToSelect, aveTimesSelected, timeOver100PercentCapacity, timeOver75PercentCapacity, timeOver50PercentCapacity, timeInsuffFood, timeInsuffWatr.

Parallel analysis of these variables suggests two factors as expected.

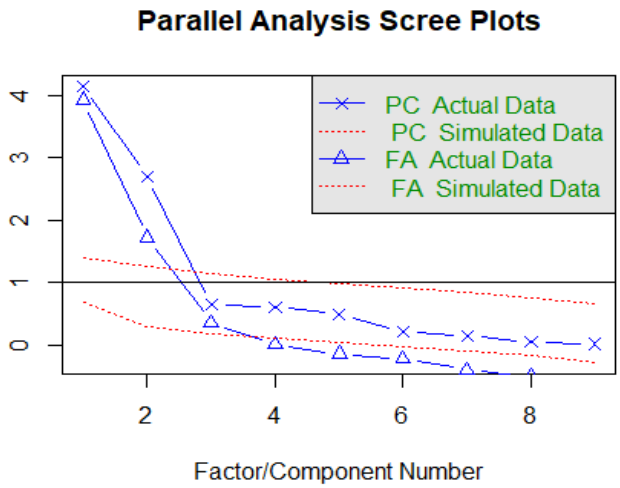


Figure 74. Parallel Analysis of Behavioral SA Indicators.

Table 65. Factor Loadings of Behavioral SA Indicators

item	MR1	MR2
p2_aveAveTimeNotViewed	0.07	0.58
p2_aveAveTimeViewed	-0.04	0.67
p2_aveTimeAlertToSelect	-0.01	0.87
p2_aveTimesSelected	0.01	0.85
p2_timeOver100PercentCapacity	0.85	-0.14
p2_timeOver75PercentCapacity	0.98	-0.04
p2_timeOver50PercentCapacity	0.85	0.00
p2_timeInsuffFood	0.90	0.09

Examining loadings for the 2-factor solution shows strong and relative equal factor loadings of indicators onto their respective factors. Accordingly, we computed composite scores for the two factor for each phase as simple means of the z-scores for each indicator; these scores correlate $r > .95$ with factor scores estimated using the ten Berge method.

We then combined these six composite scores with the estimated factor scores from the IRT model. We computed final SA scores as a unit-weighted composite of these seven indicators. These composite scores had α reliability = 0.75. Alternative SA scores computed using only the behavioral indicators also had high reliability ($\omega = 0.82$; $\alpha = 0.79$).

The composite SA scores correlated with estimated behavioral SA factor scores and unit-weighted behavioral SA scores as follows:

Table 66. Correlations among Alternative SA Scoring Methods

	scores_SA	scores_SA_bh	unit_SA_bh
scores_SA			
scores_SA_bh	0.77		
unit_SA_bh	0.96	0.82	

Note: SA = Situational Awareness; variables labeled 'bh' computed using only behavioral indicators

Summary. SA, AD and ST each had indicator variables developed from game play. The factor analyses and IRT analyses each indicate reasonable construct validity and discrimination for the items on those constructs.

3.4 Scale Inter-correlations

As shown above, the three gameplay-based scores and the three minigame questionnaire-based scores each show high levels of reliability. They additionally are only modestly correlated.

Table 67. Correlations Among Estimated Scores

		Factor Scores								Unit-weighted				
		ST	AD	SA	SA_bh	AT	AL	DR		ST	AD	SA_bh	AT	AL
Factor scores	ST													
	AD	0.43												
	SA	0.52	0.20											
	SA_bh	0.22	0.05	0.80										
	AT	0.25	0.06	0.21	0.08									
	AL	0.07	0.04	-0.09	-0.11	0.01								
	DR	0.16	0.02	0.05	-0.12	0.35	0.19							
Unit-weighted	ST	0.96	0.44	0.55	0.26	0.22	0.07	0.07						
	AD	0.39	0.91	0.26	0.12	-0.02	0.01	-0.13		0.47				
	SA_bh	0.41	0.15	0.96	0.82	0.20	-0.10	0.03		0.44	0.21			
	AT	0.28	0.07	0.19	0.03	0.96	0.02	0.37		0.23	-0.03	0.18		
	AL	0.07	0.08	-0.05	-0.06	0.06	0.88	0.19		0.06	0.05	-0.06	0.07	
	DR	0.15	0.02	0.04	-0.12	0.36	0.19	0.99		0.06	-0.13	0.02	0.38	-0.19

Note: ST = Systems Thinking; AD = Adaptability; SA = Situational Awareness; AT = Analytical Thinking; AL = Active Learning; DR = Deductive Reasoning; variables labeled 'scores' are estimated factor scores; variables labeled 'unit' are unit-weighted composites; SA variables labeled 'bh' computed using only behavioral indicators; AT variables are timed scores.

3.5 Next Directions

A future larger data collection should be used to provide stable estimates of the raw indicator means and standard deviations used to compute z-scores, as well as to establish norms for the estimated factor scores and unit-weighted scores. This type of analysis is scheduled to be done following data collection with USAF Basic Recruits at Lackland AFB.

4.0 USABILITY ASSESSMENT

4.1 Overview

Usability assessment of the game was determined through an adapted version of the System Usability Scale (SUS). The scale originally was developed by Brooke (1986) and is widely used by businesses and government (https://www.usability.gov/how-to-and-tools/methods/system-usability-scale.html). The scale has widespread acceptance for measuring usability of all types (e.g., websites, interfaces, software and applications among others). See the modified 10 items under Usability in Table 68 below. The scale is primarily descriptive in nature and extreme scores can indicate problematic areas in the game. For our purposes, it is important to remember we are not developing a game whose purpose is entertainment, but rather one to assess aptitudes and traits. As such, interpretation of scores need to keep this goal in mind.

The first assessment of usability occurred during development and testing of the three primary game flow segments. That is, players competed in the three segments where they battled the virus but played no mini-games. Examination of the usability items in Table 68 indicates nearly all scores are within plus or minus one standard deviation of the mean of the scale. This reflects positively as there are no extreme negative or positive reactions. The one exception is the item dealing with the need of a technical person to assist in the play of the game. Individuals are indicating a technical person would be helpful. This is likely due to the difficulty of the resource allocations in the game.

We assessed the effectiveness of the training with five items. Examination of these means indicate the players felt prepared to play the game. Help features were assessed with two items and subject responses indicated the features left the players at least somewhat prepared. The average number of times individuals accessed help during game play was less than two, so this speaks well of the training and structure of the gameplay.

Finally, one item asked for a global impression of the user friendliness of the game. Players indicated overall it is between OK and good; an acceptable level given the purpose of the game.

Table 68. Usability Analysis of the Core Game Flow (No mini-games)

Item	Mean	Std
Usability		
Unless otherwise noted, the items used the response scale of 1 = Strongly Agree. 2 = Agree, 3 = Neither Agree nor Disagree. 4 = Disagree, 5 = Strongly Disagree		
I think I would like to play the Virus Slayer game frequently.	2.8	1.2
I found the Virus Slayer game unnecessarily complex.	2.7	1.2
I thought the Virus Slayer game was easy to use.	3.5	1.1
I think I would need the support of a technical person to be able to play Virus Slayer.	1.8	.9
I found the various functions in Virus Slayer to be well integrated.	3.4	1.0
I thought there was too much inconsistency in Virus Slayer.	2.5	1.1
I would imagine most people would learn to use Virus Slayer very quickly.	3.8	1.0
I found Virus Slayer very cumbersome to use.	3.3	1.1
I felt very confident using Virus Slayer.	3.2	1.2
I needed to learn a lot of things before I could get going with Virus Slayer.	2.6	1.2
Training		
On a scale of 1 to 5 indicate how prepared you were to play the game after receiving training. 1 = Not at all prepared. Did not understand the controls nor the displays. 2 = Barely prepared. Understood either the controls or the displays but not both. 3 = Somewhat prepared. Understood both the controls and the information in the displays enough to begin playing the game. 4 = Highly prepared. Understood both the controls and the information in the displays at a level to be immediately competent when the game began. 5 = Extremely highly prepared. Understood		

both the controls and the information in the displays enough to play at a master's level when the game began.		
After receiving training, I was prepared to play the game	3.5	.7
At the end of training I felt confident I could play the game.	3.7	1.1
At the end of training I still had questions on how the game was played.	2.7	1.2
At the end of training I understood the purpose of the game.	4.0	.8
At the end of training I was confident I could devise a strategy to score well.	3.2	1.2
I found the help feature useful.	3.2	1.1
The help feature allowed me to play the game with confidence.	3.0	1.1
Overall		
Number of times the help function was utilized throughout gameplay.	1.8	1.7
Overall, I would rate the user friendliness of Virus Slayer as: 1 = Worst Imaginable, 2 = Awfu,l 3 = Poor, 4 = OK, 5 = Good, 6 = Excellent, 7 = Best Imaginable	4.5	1.1

Note. $N = 148$ (no missing data included)

The next point at which usability was assessed was for the deployment of the entire game, with full minigames and game play modules in place. Data were gathered and results from a sample of $N = 139$ with listwise deletion is reported below. See Table 69. The same items used in the first assessment of usability were used.

Comparison of this sample to the previous one reveals some movement in the means, but all within plus or minus the standard deviation. So descriptively, the usability of the game is positive.

Table 69. Usability Assessment of Full Game Flow

Item	Mean	Std
Usability		
Unless otherwise noted, the items used the response scale of 1 = Strongly Agree, 2 = Agree , 3 = Neither Agree nor Disagree , 4 = Disagree, 5 = Strongly Disagree		
I think I would like to play the Virus Slayer game frequently.	3.2	1.2
I found the Virus Slayer game unnecessarily complex.	3.4	1.1
I thought the Virus Slayer game was easy to use.	2.5	1.1
I think I would need the support of a technical person to be able to play Virus Slayer.	4.0	1.0
I found the various functions in Virus Slayer to be well integrated.	2.6	1.1
I thought there was too much inconsistency in Virus Slayer.	3.6	1.0
I would imagine most people would learn to use Virus Slayer very quickly.	2.5	1.2
I found Virus Slayer very cumbersome to use.	2.9	1.3
I felt very confident using Virus Slayer.	2.9	1.2
I needed to learn a lot of things before I could get going with Virus Slayer.	3.2	1.1
Training		
On a scale of 1 to 5 indicate how prepared you were to play the game after receiving training. 1=Not at all prepared. Did not understand the controls nor the displays. 2=Barely prepared. Understood either the controls or the displays but not both. 3=Somewhat prepared. Understood both the controls and the information in the displays enough to begin playing the game. 4=Highly prepared. Understood both the controls and the information in the displays at a level to be immediately competent when the game began. 5=Extremely highly prepared. Understood both the controls and the information in the displays enough to play at a master's level when the game began.		

After receiving training, I was prepared to play the game	2.3	1.0
At the end of training, I felt confident I could play the game.	3.3	1.1
At the end of training, I still had questions on how the game was played.	1.9	.8
At the end of training, I understood the purpose of the game.	2.8	1.2
At the end of training, I was confident I could devise a strategy to score well.	2.8	1.2
I found the help feature useful.	2.89	1.1
The help feature allowed me to play the game with confidence.	3.5	.7
Overall		
Number of times the help function was utilized throughout gameplay.	2.9	1.1
Overall, I would rate the user friendliness of Virus Slayer as: 1=Worst Imaginable 2=Awful 3=Poor 4=OK 5=Good 6=Excellent 7=Best Imaginable	5.9	1.1

Note. $N = 148$ (no missing data included)

Upcoming : Based on the perception of usability from MTurk workers, the VIRUS SLAYER serious game can be used as an assessment. It will be important, however, to continue to assess usability when the game is utilized on a sample of Air Force personnel. Appropriate choices would be individuals in BMT at Lackland AFB and those in basic cyber training at Keesler AFB.

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6.0 LIST OF ABBREVIATIONS, ACRONYMS AND SYMBOLS

AD	Adaptability
AFOQT	Air Force Officer Qualifying Test
AFRL	Air Force Research Laboratory
AFSC	Air Force Specialty Code
AIC	Akaike Information Criterion
AL	Active Learning
ASVAB	Armed Services Vocational Aptitude Battery
AT	Analytical Thinking
BMT	Basic Military Training
CFM	Career Field Manager
COVID-19	Corona Virus 19
DoD	Department of Defense
DR	Deductive Reasoning
EAP	Expected A Posteriori
EDPT	Electronic Data Processing
HCI	Human Computer Interaction
HIT	Human Intelligence Tasks
IRT	Item Response Theory
MEPS	Military Entrance Processing Station
ML	Maximum Likelihood
MTurk	Mechanical Turk
SA	Situational Awareness
SDI-O	Self-Description Inventory
SME	Subject Matter Expert
SUS	System Usability Scale
TAPAS	Tailored Adaptive Personality Assessment System
USAF	United States Air Force

APPENDIX A - Survey as Presented in Qualtrics

Rank ordering of Aptitudes and Traits on Importance to Cyber Workers

Rank ordering of Aptitudes and Traits on Importance to the Air Force Cyber Workforce

Our work is focused on developing an assessment of certain traits and aptitudes that are important to the following AFSCs: enlisted: 3D0X2 (Cyber Systems Operations), 1B4X1 (Cyber Warfare Operations), 1N4X1A (Digital Network Analyst), 3D1X2 (Cyber Transport Systems); officer: 17DX/SX (Network Operations/Cyber Space Operations)

The aptitudes and traits to be the focus of our work are the following:

Aptitudes	Traits
Active Learning	Analytical Thinking
Decision Making	Adaptability
Deductive Reasoning	Dependability
Systems Thinking	Persistence
	Situational Awareness

The definitions for each is as follows:
Aptitudes:

- **Active Learning -** The ability to understand the implications of new information for both current and future problem-solving and decision-making.
- **Decision Making** - The ability to consider the relative costs and benefits of potential actions to choose the most appropriate one.

- **Deductive Reasoning -** The ability to apply general rules to specific problems to produce answers that make sense.
- **Systems Thinking -** The ability to understand how multiple parts of a system interact and influence each other.

Traits:

- **Analytical Thinking -** The degree to which individuals analyze information and use logic to address work-related issues and problems.
- **Adaptability -** The degree to which individuals are open to change (positive or negative) and to considerable variety in the workplace.
- **Dependability -** The degree to which individuals are reliable, responsible, and dependable, and fulfill obligations.
- **Persistence –** The degree to which individuals have persistence in the face of obstacles.
- **Situational Awareness –** The degree to which individuals pay attention to their surroundings and rarely get lost or surprised.

Below, we ask you one background questions, three different questions for each the aptitudes and the traits, and one final question on both the aptitudes and traits.

What is your AFSC?

- ○ 1B4
- ○ 1N4
- ○ 3D0
- ○ 3D1
- ○ 17X

1.1 Consider all of the AFSCs above and each of the aptitudes. Drag and drop the aptitudes below to rank order them by relevance to performance in training, where 1=average relevance to training performance and 4=extreme relevance to training performance.

Deductive Reasoning

1.2 Consider all of the AFSCs above and each of the traits. Drag and drop the traits below to rank order them by relevance to performance in training, where 1=average relevance to training performance, 3=high relevance to training performance and 5=extreme relevance to training performance.

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Active Learning

1=average relevance to on-the-job performance, 3=high relevance to on-the-job performance and 5=extreme relevance to on-the-job performance.

3.1 Consider all of the AFSCs above and each of the aptitudes. Drag and drop the aptitudes below to rank order them by the expected incremental benefit provided when measures of the construct are used with existing DoD tests, where 1=least incremental benefit and 4=highest incremental benefit.

Awareness

Persistence

Dependability

Adaptability

Note: All response options were randomized throughout the survey.

APPENDIX B - Letter To Cyber Career Field Managers

Dear [Name],

My team and I are working with Tom Carretta, James Johnson, and others to enhance the selection procedure of personnel in certain Air Force cyber occupations. This process will focus on the measurement of traits and aptitudes necessary for competency in these career fields. As such, we are asking for input in the form of having cyber operators respond to a brief USAF approved survey by rank ordering nine different aptitudes and traits according to their importance for success in both training and on-the-job performance.

Tom Carretta suggested the way to ensure an optimal response rate for the survey is to have the request come from Career Field Managers. Here are instructions for sending the email request.

Attached are Outlook templates (01 Initial Air Force Cyber Workforce Survey Email, 02 Reminder Air Force Cyber Workforce Survey Email) containing a link to the survey and an Excel spreadsheet with duty emails of the pre-selected Airmen in each career field. In the spreadsheet, select and copy (ctrl+c) the column of emails (EMAIL_DUTY) and paste (ctrl+v) them into the "To" field of the email template. Please change the highlighted suspense date to two weeks from the email being sent, add any additional personal comments, and send.

We know you are extremely busy and truly appreciate your assistance with this request. Please let me know if you have any questions regarding this request.

V/R

Michael D. Coovert

APPENDIX C - Examples from the Help Feature

The game provides a help feature that can be invoked at any point during game play. The feature provides an explanation of each of the major menu components. These help explanations are presented below following a system of working from the upper left corner of the player's screen and moving in a clockwise fashion.

During training, the following screen introduces the player to the help feature by explaining they merely need to click the ubiquitous ***i*** (information) button to receive help on elements in that window. See Figure C-1.

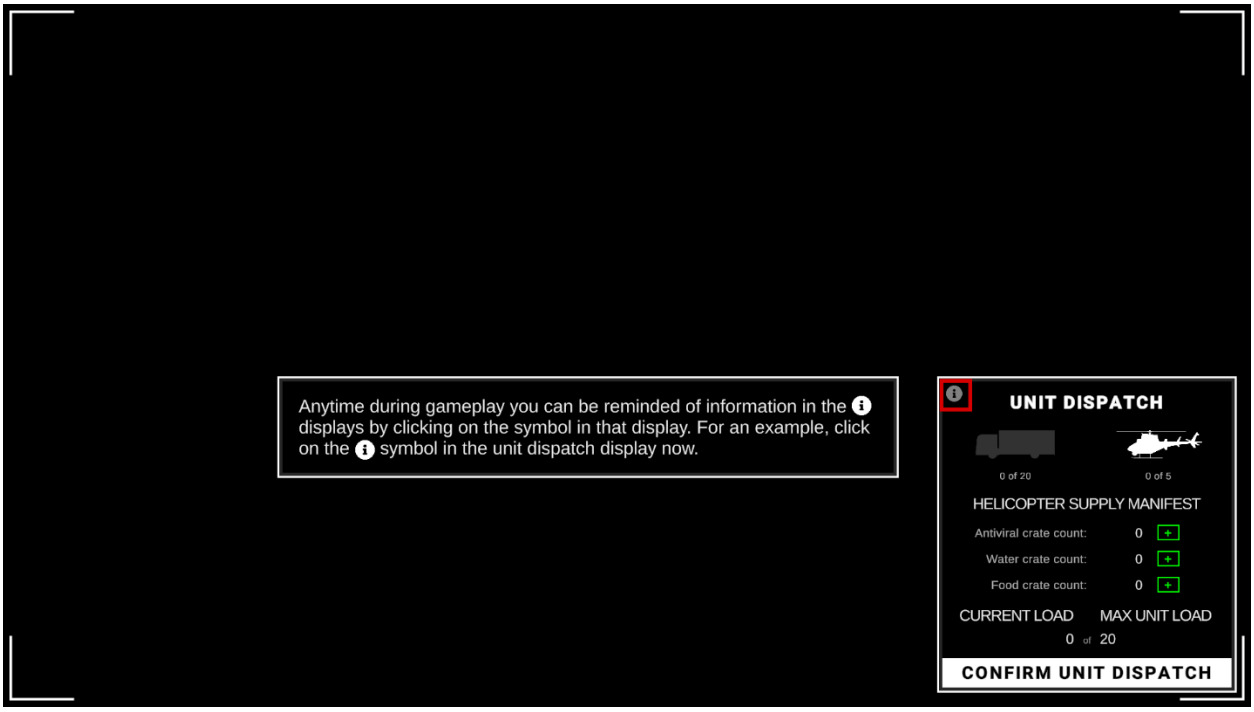


Figure C-1. During training, the above screen introduces the help feature to players.

Another help screen provides an explanation of the elements in the Population window. It reflects the current state of the population in terms of those infected, cured, and died. In phases two and three of game play this window also contains the players score for the previous phases.

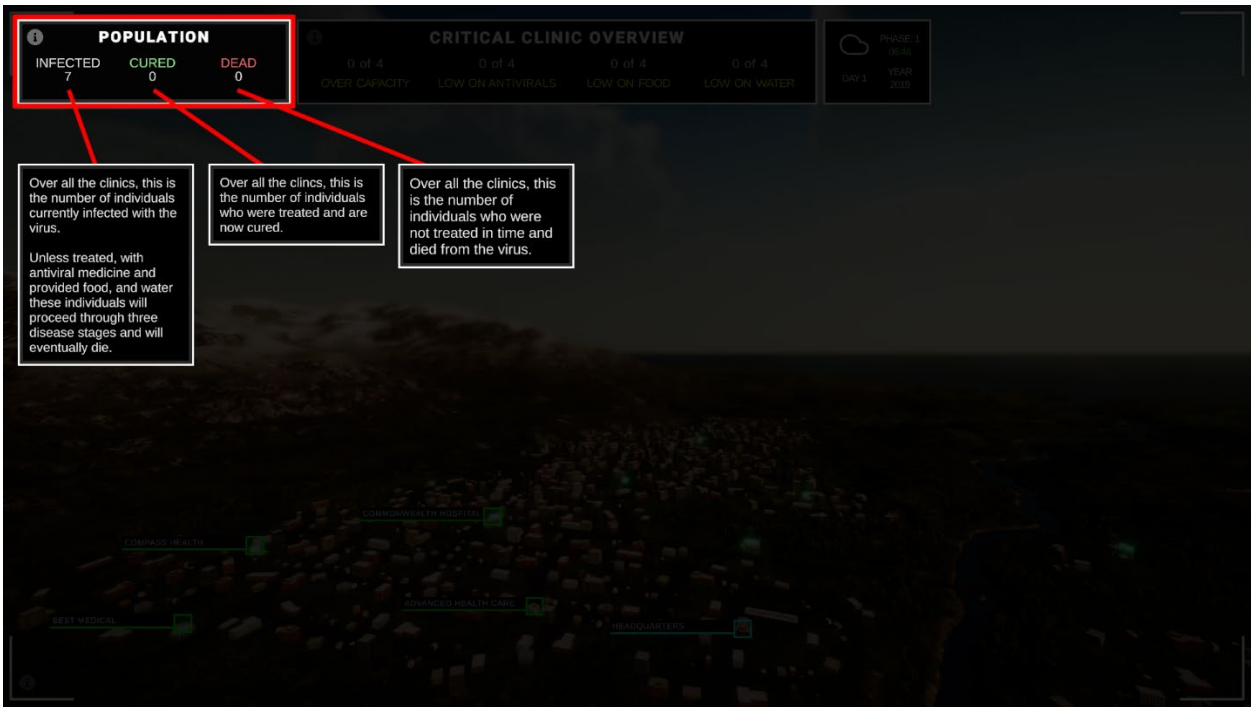


Figure C-2. Explanation of the elements in the Population window.

It reflects the current state of the population in terms of those infected, cured, and died. In Phases 2 and 3 of game play, this window also contains the players score for the previous phases.

The next menu, Figure C-3, provides information on those clinics or hospitals in a critical state. Each clinic has a finite capacity for treating individuals 50, 175, or 250. Once at capacity, they can no longer treat patients. The next three pieces of information in the critical clinic overview window indicate the number of clinics low on the three supplies: antivirals, food, and water. This provides real time feedback to the player on the effectiveness of their strategy. The small sub-window to the right provides information on the current environmental conditions (degrading weather impacts the amount of supplies that can be safely transported to clinics and hospitals without risking the vehicle crashing and losing the supplies. Also, provided in the window is the Phase of the game (one, two, or three), a countdown timer indicates to the player elapsed time into the Phase, the current year, and number of days since the virus infection began. See Figure C-3 below.

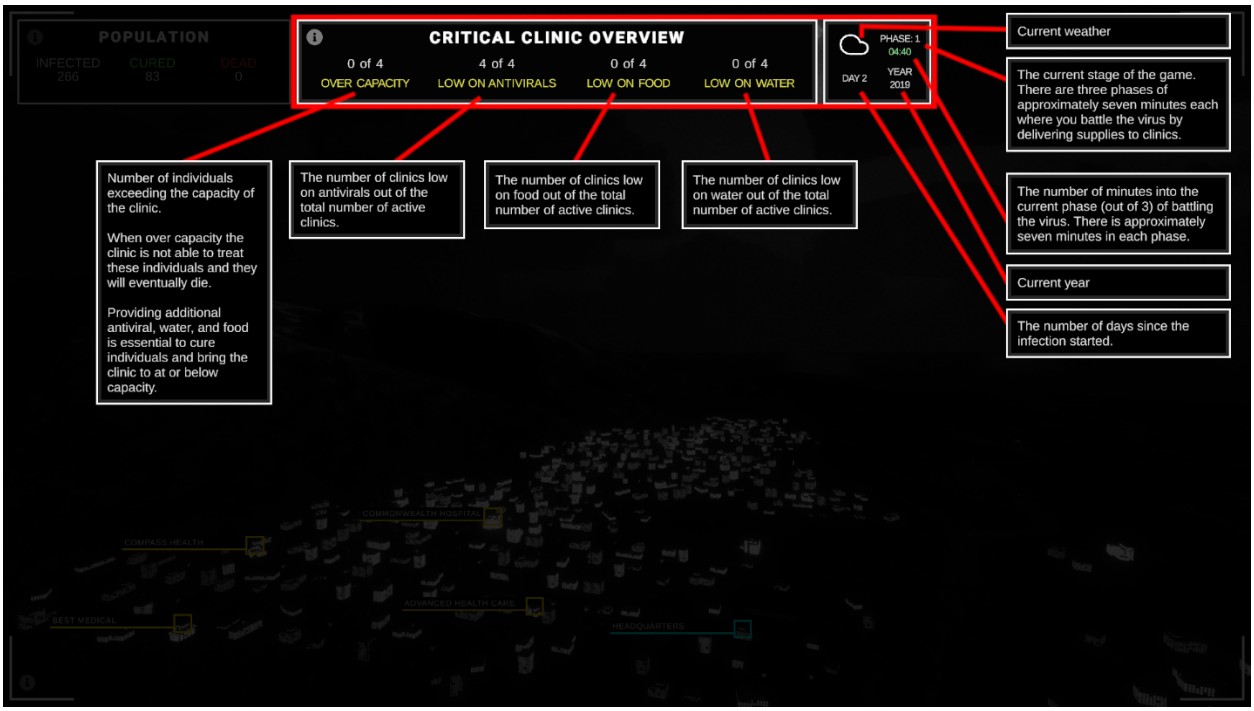


Figure C-3. Help associated with the window providing player information on the number of clinics and hospitals in critical states and a sub-window on the environmental and time state of game play.

The next help window provides information on each clinic when it is clicked on to reveal relevant information. See Figure C-4. Beginning at the top and moving down to the bottom, the following information is provided. First is the name of the clinic (hospital), its current operational status (normal, degrading, critical), and the maximum capacity for patients. Next, detailed information regarding the current patient load is provided. This is the number of patients in each of three stages of disease progression, the number in recovery, cured, and dead. The lowest part of the window provides the levels of each of the supplies (antivirals, water, food) required by the treatment centers. See Figure C-4.

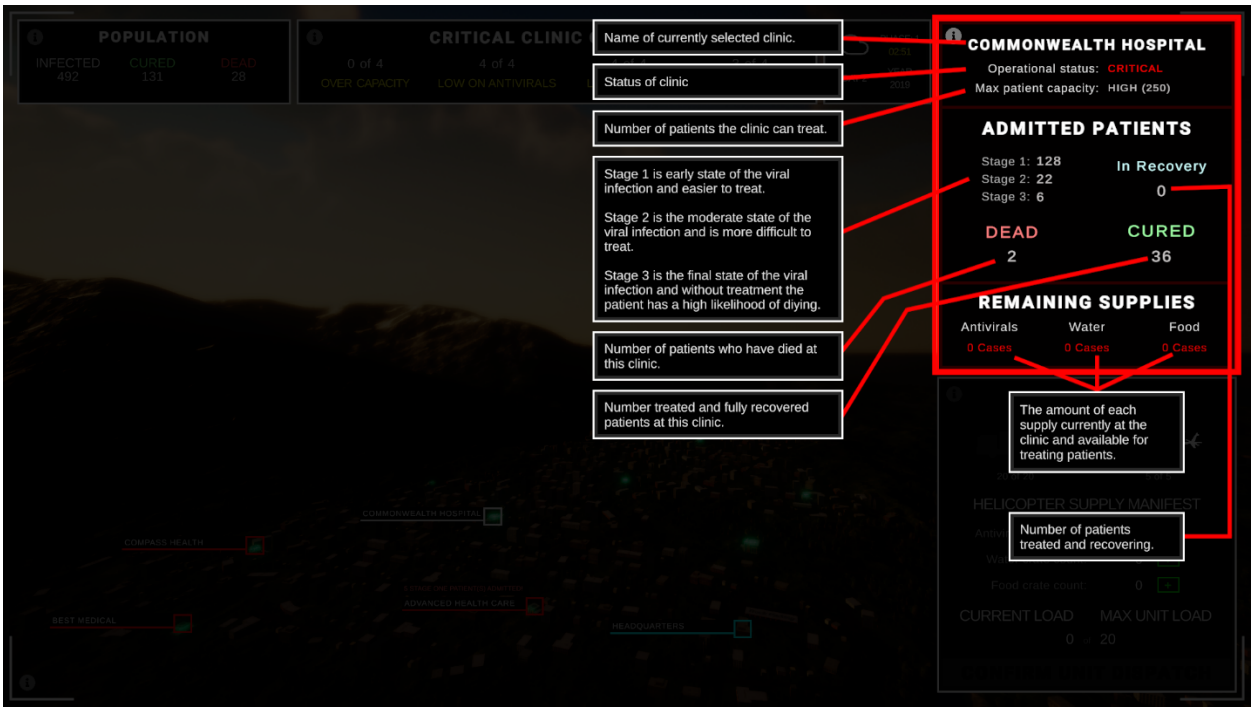


Figure C-4. Detailed information on the selected treatment center.

The lower right window provides information on loading and dispatching supplies to treatment centers. The top portion of the window allows the player to select the truck or the helicopter. The difference between these modes of delivery can be substantial. On the one hand, the truck can carry twice as many supplies as the helicopter, 40 versus 20 units, respectively. On the other hand, the trucks travel at a slower speed and are restricted to traveling the roads in the city. The helicopters travel at a faster speed and can fly directly to the treatment center, as they are not restricted to virtual roads in the sky (e.g., there are no air routes, visual operating restrictions [VOR], or other way points through which they must navigate to move from point to point and ultimately destination). Trucks depart from and return to a common parking garage and helicopters depart from and return to a common airfield.

After selecting the truck or helicopter, the player loads the vehicle by clicking on antiviral, water or food. These are loaded in groups of five units and any combination, constrained by the five units can be loaded. Vehicles can be loaded up through their capacity and then be dispatched. Trucks can be dispatched carrying 0, 5, 10, 15, 20, 25, 30, 35, or 40 units and helicopters dispatched carrying 0, 5, 10, 15, or 20 units. For example, a player could select the helicopter and proceed to load the following combinations of units prior to dispatching it, see Table C-1 for examples of the various combinations. If a player inadvertently loads too much of a supply, these can be rectified by clicking a minus sign corresponding to the overloaded supply. As supplies are added to the helicopter or truck, the Current Load is updated. This provided a convenient reminder to the player as it is displayed next to the Max Unit Load for the selected unit. After loading is complete, the player clicks on the highlighted Confirm Unit Dispatch button. If there are no units available, for example all the helicopters are dispatched, the confirm unit dispatch button will not be enabled and no unit can be dispatched. See Figure C-5 for help on the Unit Dispatch window.

Table C-1. Example supply combinations for the helicopter and truck.

	Helicopter				Truck	
Antiviral	Water	Food		Antiviral	Water	Food
20	0	0		40	0	0
15	5	0		30	10	0
10	5	5		20	10	10
10	0	10		20	0	20
5	5	5		10	10	10

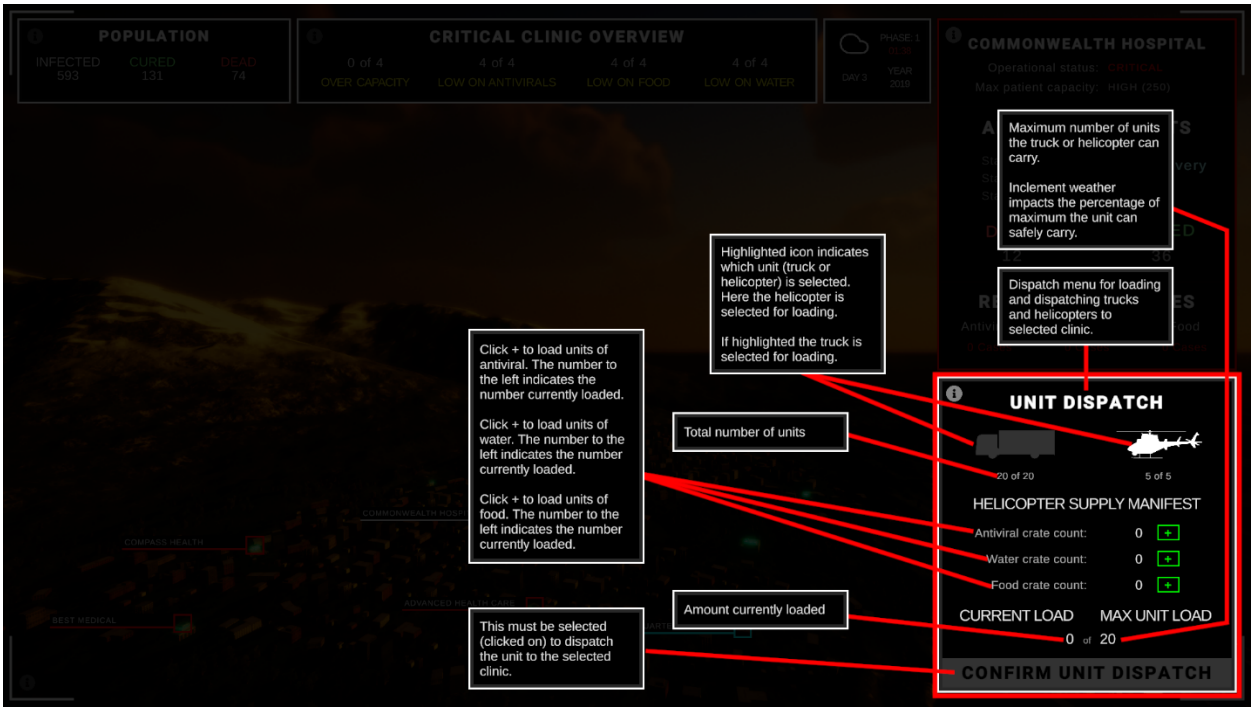
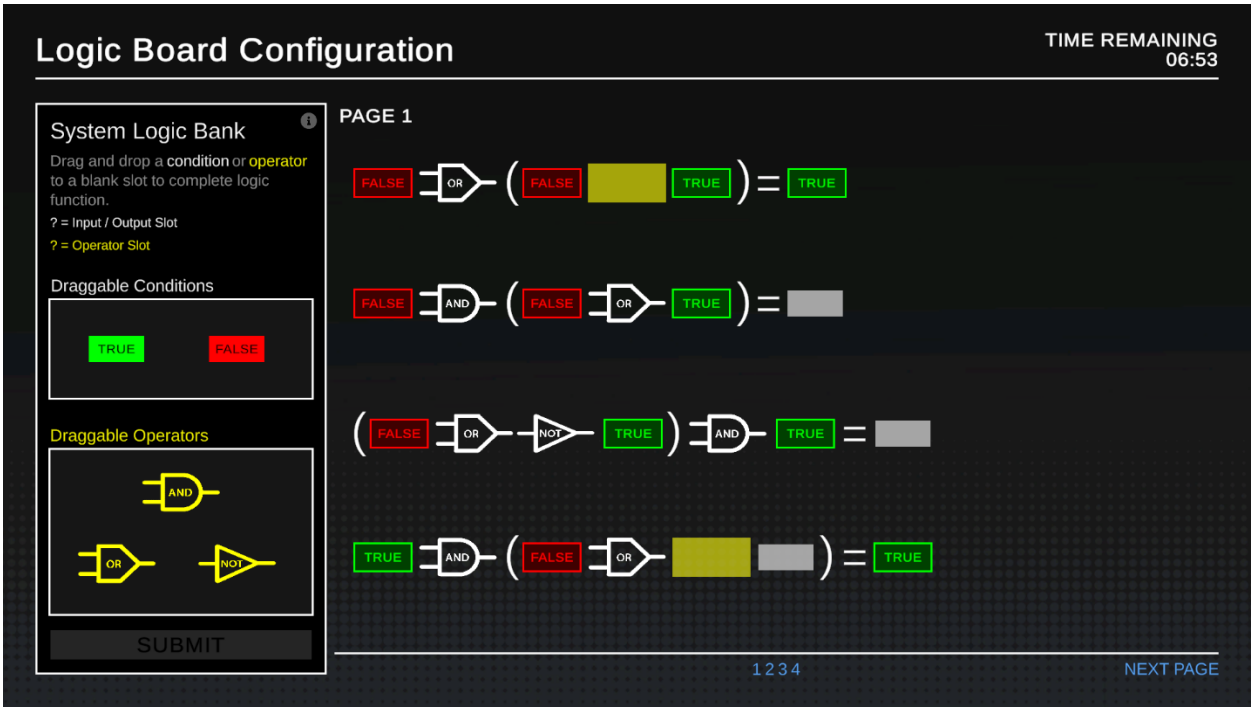
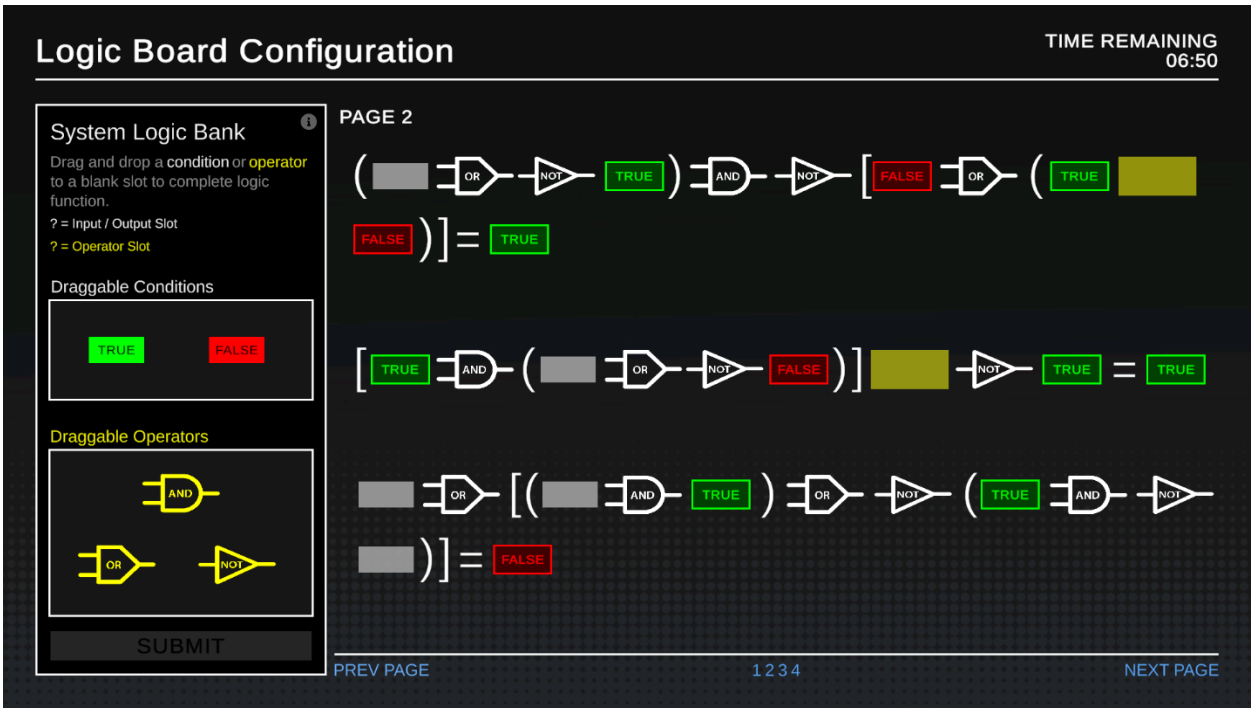


Figure C-5. Unit Dispatch help screen.

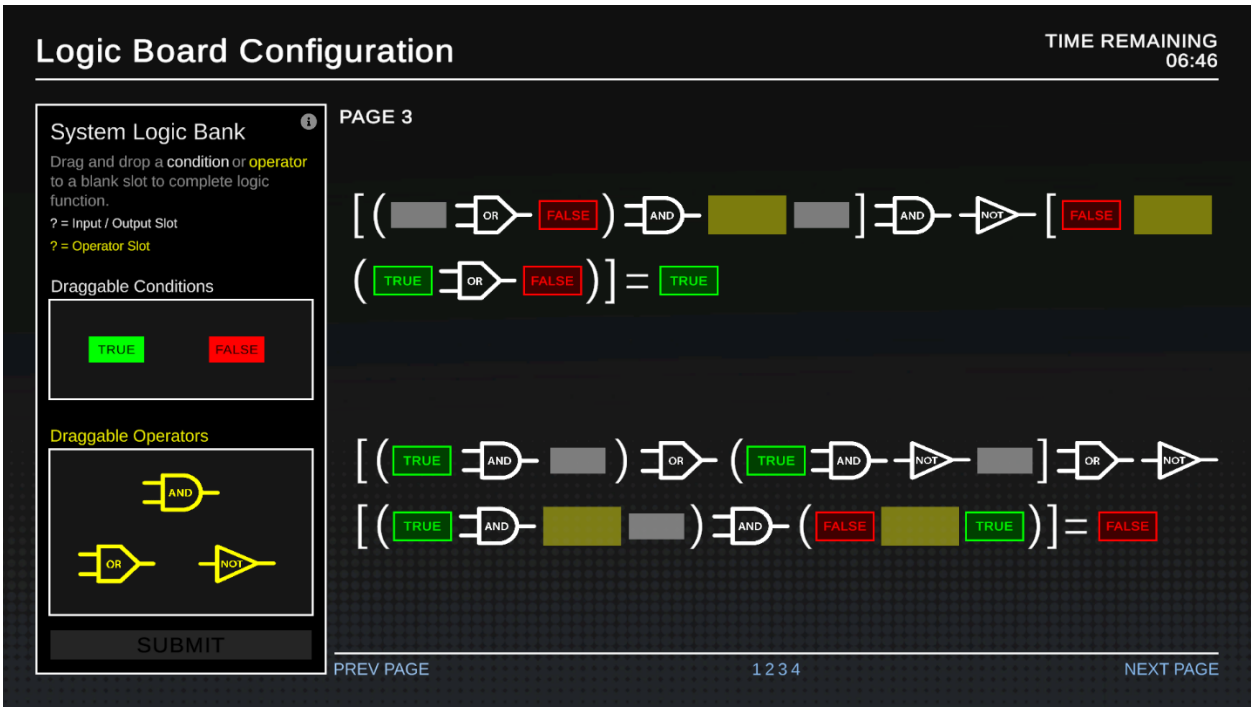
Appendix D. Deductive Reasoning Items in Drag and Drop Form



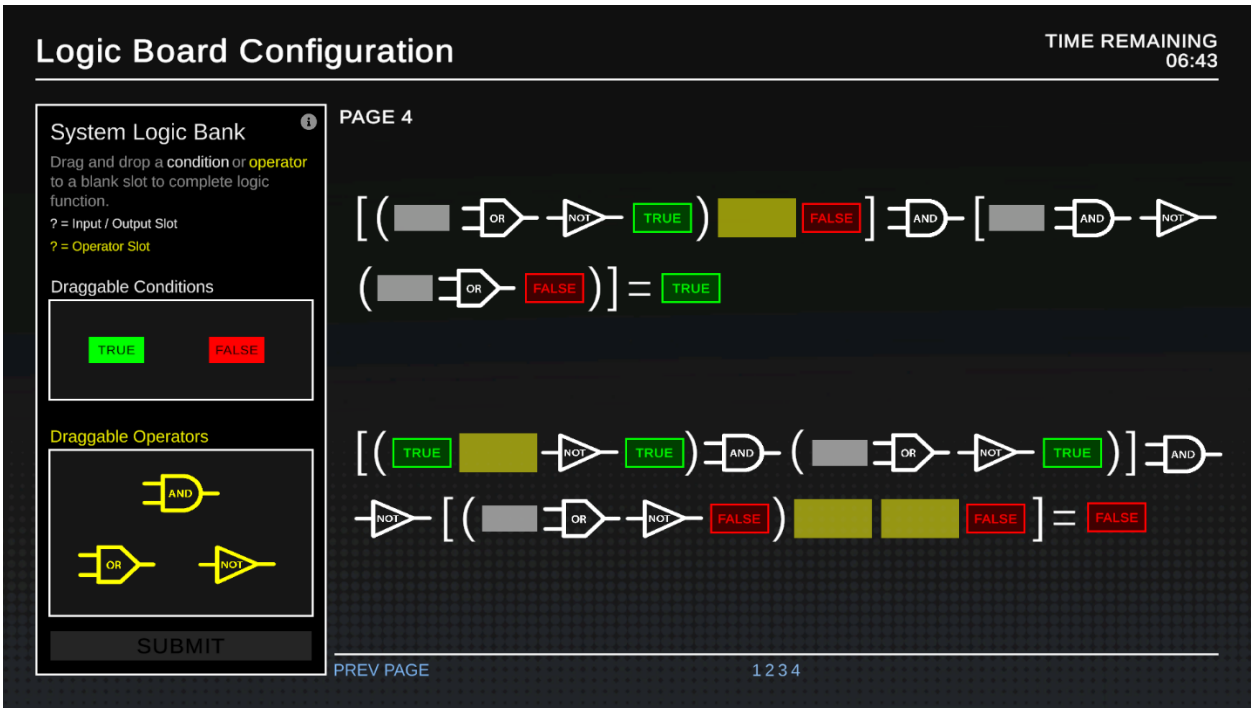
Drag and drop mini-game, responses 1-5.



Drag and drop mini-game, responses 6-12.



Drag and drop mini-game, responses 13-20.



Drag and drop mini-game, responses 21-29.

- **p1_5m_averageClinicTimeNotViewed**

For each active clinic's time **not** viewed *(At Phase 1, 5 minutes in, currently 4 clinics are active)*, each clinic's time **not** viewed *(p1_5m_totalTimeNotViewed_c1, p1_5m_totalTimeNotViewed_c2, p1_5m_totalTimeNotViewed_c3, p1_5m_totalTimeNotViewed_c4)* are averaged together to get the total average time **not** viewed.

- **p1_5m_averageClinicTimeViewed**

For each active clinic's time viewed *(At Phase 1, 5 minutes in, currently 4 clinics are active)*, each clinic's time viewed *(p1_5m_totalTimeNotViewed_c1, p1_5m_totalTimeNotViewed_c2, p1_5m_totalTimeNotViewed_c3, p1_5m_totalTimeNotViewed_c4)* are averaged together to get the total average time viewed.

- **p1_5m_averageHelicopterLoadCapacity**

The average load capacity for all dispatched helicopters at the current phase of gameplay and current timestamp.

- **p1_5m_averageTruckLoadCapacity**

The average load capacity for all dispatched trucks at the current phase of gameplay and current timestamp.

- **p1_5m_helicoptersOver75PercentCapacity**

The total helicopters dispatched over 75% capacity at the current phase of gameplay and current timestamp.

- **p1_5m_trucksOver75PercentCapacity**

The total trucks dispatched over 75% capacity at the current phase of gameplay and current timestamp.

- **p1_5m_totalHelicoptersDispatched**

The total number of helicopters dispatched at the current phase of gameplay and current timestamp.

- **p1_5m_totalTrucksDispatched**

The total number of trucks dispatched at the current phase of gameplay and current timestamp.

- **p1_5m_timeStamp**

The actual time and date of this data snapshot.

- **p1_5m_clinicName_c1**

The current clinic name.

- **p1_5m_cured_c1**

The total number of cured patients at the current phase of gameplay and current timestamp.

- **p1_5m_deaths_c1**

The total number of dead patients at the current phase of gameplay and current timestamp.

- **p1_5m_deliveredAntivirals_c1**

The total number of antivirals **successfully** delivered to this specific clinic at the current phase of gameplay and current timestamp.

- **p1_5m_deliveredFood_c1**

The total number of food **successfully** delivered to this specific clinic at the current phase of gameplay and current timestamp.

- **p1_5m_deliveredWater_c1**

The total number of water **successfully** delivered to this specific clinic at the current phase of gameplay and current timestamp.

- **p1_5m_phaseOneInfections_c1**

The total number of infected patients who are in the first phase of infection at the current phase of gameplay and current timestamp.

- **p1_5m_phaseTwoInfections_c1**

The total number of infected patients who are in the second phase of infection at the current phase of gameplay and current timestamp.

- **p1_5m_phaseThreeInfections_c1**

The total number of infected patients who are in the third phase of infection at the current phase of gameplay and current timestamp.

- **p1_5m_sentAntivirals_c1**

The total number of antivirals sent both **successfully and unsuccessfully** to active clinics at the current phase of gameplay and current timestamp.

- **p1_5m_sentFood_c1**

The total number of food sent both **successfully and unsuccessfully** to active clinics at the current phase of gameplay and current timestamp.

- **p1_5m_sentWater_c1**

The total number of water sent both **successfully and unsuccessfully** to active clinics at the current phase of gameplay and current timestamp.

- **p1_5m_state_c1**

The state of the current clinic at the current phase of gameplay and current timestamp.

- **p1_5m_timeOver100PercentCapacity_c1**

The total time this specific clinic spent over 100% of its max patient capacity at the current phase of gameplay and current timestamp.

- **p1_5m_timeOver75PercentCapacity_c1**

The total time this specific clinic spent over 75% of its max patient capacity at the current phase of gameplay and current timestamp.

- **p1_5m_timeOver50PercentCapacity_c1**

The total time this specific clinic spent over 50% of its max patient capacity at the current phase of gameplay and current timestamp.

- **p1_5m_timesSelected_c1**

The number of times this specific clinic has been viewed by the player at the current phase of gameplay and current timestamp.

- **p1_5m_timeWithoutSufficientFood_c1**

The total time in seconds this specific clinic spent without sufficient food at the current phase of gameplay and current timestamp.

- **p1_5m_timeWithoutSufficientWater_c1**

The total time in seconds this specific clinic spent without sufficient water at the current phase of gameplay and current timestamp.

p1_5m_totalTimeFromAlertToSelect_c1

The total time in seconds this specific clinic spent from the time it populated its first new unread alerts, to the time the user viewed/selected the clinic at the current phase of gameplay and current timestamp.

- **p1_5m_totalTimeNotViewed_c1**

The total time in seconds this specific clinic spent **not** being viewed/selected by the player at the current phase of gameplay and current timestamp.

- **p1_5m_totalTimeViewed_c1**

The total time in seconds this specific clinic spent being viewed/selected by the player at the current phase of gameplay and current timestamp.

APPENDIX F - Complete List of Variables Gathered in the Game

Our purpose in providing this appendix is to inform the reader of the variables monitored throughout gameplay and were extracted for analysis throughout game development. A separate program was used to extract the variables from Firebase and write them to a database which was analyzed. The variable names are provided for information only and no description is provided beyond what can be culled from the name.

Variables

dateCreated

userId

PHASE 1, 5 MINUTES IN

State of core loop metrics 5 minutes into Phase 1. Includes data for 4 total clinics and the headquarters.

p1_5m_averageClinicTimeNotViewed

p1_5m_averageClinicTimeViewed

p1_5m_averageHelicopterLoadCapacity

p1_5m_averageTruckLoadCapacity

p1_5m_helicoptersOver75PercentCapacity

p1_5m_trucksOver75PercentCapacity

p1_5m_totalHelicoptersDispatched

p1_5m_totalTrucksDispatched

p1_5m_timeStamp

p1_5m_clinicName_c1

p1_5m_cured_c1

p1_5m_deaths_c1

p1_5m_deliveredAntivirals_c1

p1_5m_deliveredFood_c1

p1_5m_deliveredWater_c1

p1_5m_phaseOneInfections_c1

p1_5m_phaseTwoInfections_c1

p1_5m_phaseThreeInfections_c1

p1_5m_sentAntivirals_c1

p1_5m_sentFood_c1

p1_5m_sentWater_c1

p1_5m_state_c1

p1_5m_timeOver100PercentCapacity_c1

p1_5m_timeOver75PercentCapacity_c1

p1_5m_timeOver50PercentCapacity_c1

p1_5m_timesSelected_c1

p1_5m_timeWithoutSufficientFood_c1

p1_5m_timeWithoutSufficientWater_c1

p1_5m_totalTimeFromAlertToSelect_c1

p1_5m_totalTimeNotViewed_c1

p1_5m_totalTimeViewed_c1

p1_5m_clinicName_c2

p1_5m_cured_c2

p1_5m_deaths_c2

p1_5m_deliveredAntivirals_c2

p1_5m_deliveredFood_c2

p1_5m_deliveredWater_c2

p1_5m_phaseOneInfections_c2

p1_5m_phaseTwoInfections_c2

p1_5m_phaseThreeInfections_c2

p1_5m_sentAntivirals_c2

p1_5m_sentFood_c2

p1_5m_sentWater_c2

p1_5m_state_c2

p1_5m_timeOver100PercentCapacity_c2

p1_5m_timeOver75PercentCapacity_c2

p1_5m_timeOver50PercentCapacity_c2

p1_5m_timesSelected_c2

p1_5m_timeWithoutSufficientFood_c2

p1_5m_timeWithoutSufficientWater_c2

p1_5m_totalTimeFromAlertToSelect_c2

p1_5m_totalTimeNotViewed_c2

p1_5m_totalTimeViewed_c2

p1_5m_clinicName_c3

p1_5m_cured_c3

p1_5m_deaths_c3

p1_5m_deliveredAntivirals_c3

p1_5m_deliveredFood_c3

p1_5m_deliveredWater_c3

p1_5m_phaseOneInfections_c3

p1_5m_phaseTwoInfections_c3

p1_5m_phaseThreeInfections_c3

p1_5m_sentAntivirals_c3

p1_5m_sentFood_c3

p1_5m_sentWater_c3

p1_5m_state_c3

p1_5m_timeOver100PercentCapacity_c3

p1_5m_timeOver75PercentCapacity_c3

p1_5m_timeOver50PercentCapacity_c3

p1_5m_timesSelected_c3

p1_5m_timeWithoutSufficientFood_c3

p1_5m_timeWithoutSufficientWater_c3

p1_5m_totalTimeFromAlertToSelect_c3

p1_5m_totalTimeNotViewed_c3

p1_5m_totalTimeViewed_c3

p1_5m_clinicName_c4

p1_5m_cured_c4

p1_5m_deaths_c4

p1_5m_deliveredAntivirals_c4

p1_5m_deliveredFood_c4

p1_5m_deliveredWater_c4

p1_5m_phaseOneInfections_c4

p1_5m_phaseTwoInfections_c4

p1_5m_phaseThreeInfections_c4

p1_5m_sentAntivirals_c4

p1_5m_sentFood_c4

p1_5m_sentWater_c4

p1_5m_state_c4

p1_5m_timeOver100PercentCapacity_c4

p1_5m_timeOver75PercentCapacity_c4

p1_5m_timeOver50PercentCapacity_c4

p1_5m_timesSelected_c4

p1_5m_timeWithoutSufficientFood_c4

p1_5m_timeWithoutSufficientWater_c4

p1_5m_totalTimeFromAlertToSelect_c4

p1_5m_totalTimeNotViewed_c4

p1_5m_totalTimeViewed_c4

PHASE 1, 6 MINUTES IN

State of core loop metrics 6 minutes into Phase One. Includes data for 4 total clinics and the headquarters.

p1_6m_averageClinicTimeNotViewed

p1_6m_averageClinicTimeViewed

p1_6m_averageHelicopterLoadCapacity

p1_6m_averageTruckLoadCapacity

p1_6m_helicoptersOver75PercentCapacity

p1_6m_trucksOver75PercentCapacity

p1_6m_totalHelicoptersDispatched

p1_6m_totalTrucksDispatched

p1_6m_timeStamp

p1_6m_clinicName_c1

p1_6m_cured_c1

p1_6m_deaths_c1

p1_6m_deliveredAntivirals_c1

p1_6m_deliveredFood_c1

p1_6m_deliveredWater_c1

p1_6m_phaseOneInfections_c1

p1_6m_phaseTwoInfections_c1

p1_6m_phaseThreeInfections_c1

p1_6m_sentAntivirals_c1

p1_6m_sentFood_c1

p1_6m_sentWater_c1

p1_6m_state_c1

p1_6m_timeOver100PercentCapacity_c1

p1_6m_timeOver75PercentCapacity_c1

p1_6m_timeOver50PercentCapacity_c1

p1_6m_timesSelected_c1

p1_6m_timeWithoutSufficientFood_c1

p1_6m_timeWithoutSufficientWater_c1

p1_6m_totalTimeFromAlertToSelect_c1

p1_6m_totalTimeNotViewed_c1

p1_6m_totalTimeViewed_c1

p1_6m_clinicName_c2

p1_6m_cured_c2

p1_6m_deaths_c2

p1_6m_deliveredAntivirals_c2

p1_6m_deliveredFood_c2

p1_6m_deliveredWater_c2

p1_6m_phaseOneInfections_c2

p1_6m_phaseTwoInfections_c2

p1_6m_phaseThreeInfections_c2

p1_6m_sentAntivirals_c2

p1_6m_sentFood_c2

p1_6m_sentWater_c2

p1_6m_state_c2

p1_6m_timeOver100PercentCapacity_c2

p1_6m_timeOver75PercentCapacity_c2

p1_6m_timeOver50PercentCapacity_c2

p1_6m_timesSelected_c2

p1_6m_timeWithoutSufficientFood_c2

p1_6m_timeWithoutSufficientWater_c2

p1_6m_totalTimeFromAlertToSelect_c2

p1_6m_totalTimeNotViewed_c2

p1_6m_totalTimeViewed_c2

p1_6m_clinicName_c3

p1_6m_cured_c3

p1_6m_deaths_c3

p1_6m_deliveredAntivirals_c3

p1_6m_deliveredFood_c3

p1_6m_deliveredWater_c3

p1_6m_phaseOneInfections_c3

p1_6m_phaseTwoInfections_c3

p1_6m_phaseThreeInfections_c3

p1_6m_sentAntivirals_c3

p1_6m_sentFood_c3

p1_6m_sentWater_c3

p1_6m_state_c3

p1_6m_timeOver100PercentCapacity_c3

p1_6m_timeOver75PercentCapacity_c3

p1_6m_timeOver50PercentCapacity_c3

p1_6m_timesSelected_c3

p1_6m_timeWithoutSufficientFood_c3

p1_6m_timeWithoutSufficientWater_c3

p1_6m_totalTimeFromAlertToSelect_c3

p1_6m_totalTimeNotViewed_c3

p1_6m_totalTimeViewed_c3

p1_6m_clinicName_c4

p1_6m_cured_c4

p1_6m_deaths_c4

p1_6m_deliveredAntivirals_c4

p1_6m_deliveredFood_c4

p1_6m_deliveredWater_c4

p1_6m_phaseOneInfections_c4

p1_6m_phaseTwoInfections_c4

p1_6m_phaseThreeInfections_c4

p1_6m_sentAntivirals_c4

p1_6m_sentFood_c4

p1_6m_sentWater_c4

p1_6m_state_c4

p1_6m_timeOver100PercentCapacity_c4

p1_6m_timeOver75PercentCapacity_c4

p1_6m_timeOver50PercentCapacity_c4

p1_6m_timesSelected_c4

p1_6m_timeWithoutSufficientFood_c4

p1_6m_timeWithoutSufficientWater_c4

p1_6m_totalTimeFromAlertToSelect_c4

p1_6m_totalTimeNotViewed_c4

p1_6m_totalTimeViewed_c4

PHASE 1, 7 MINUTES IN

State of core loop metrics 7 minutes into Phase 1. Includes data for 4 total clinics and the headquarters.

p1_7m_averageClinicTimeNotViewed

p1_7m_averageClinicTimeViewed

p1_7m_averageHelicopterLoadCapacity

p1_7m_averageTruckLoadCapacity

p1_7m_helicoptersOver75PercentCapacity

p1_7m_trucksOver75PercentCapacity

p1_7m_totalHelicoptersDispatched

p1_7m_totalTrucksDispatched

p1_7m_timeStamp

p1_7m_clinicName_c1

p1_7m_cured_c1

p1_7m_deaths_c1

p1_7m_deliveredAntivirals_c1

p1_7m_deliveredFood_c1

p1_7m_deliveredWater_c1

p1_7m_phaseOneInfections_c1

p1_7m_phaseTwoInfections_c1

p1_7m_phaseThreeInfections_c1

p1_7m_sentAntivirals_c1

p1_7m_sentFood_c1

p1_7m_sentWater_c1

p1_7m_state_c1

p1_7m_timeOver100PercentCapacity_c1

p1_7m_timeOver75PercentCapacity_c1

p1_7m_timeOver50PercentCapacity_c1

p1_7m_timesSelected_c1

p1_7m_timeWithoutSufficientFood_c1

p1_7m_timeWithoutSufficientWater_c1

p1_7m_totalTimeFromAlertToSelect_c1

p1_7m_totalTimeNotViewed_c1

p1_7m_totalTimeViewed_c1

p1_7m_clinicName_c2

p1_7m_cured_c2

p1_7m_deaths_c2

p1_7m_deliveredAntivirals_c2

p1_7m_deliveredFood_c2

p1_7m_deliveredWater_c2

p1_7m_phaseOneInfections_c2

p1_7m_phaseTwoInfections_c2

p1_7m_phaseThreeInfections_c2

p1_7m_sentAntivirals_c2

p1_7m_sentFood_c2

p1_7m_sentWater_c2

p1_7m_state_c2

p1_7m_timeOver100PercentCapacity_c2

p1_7m_timeOver75PercentCapacity_c2

p1_7m_timeOver50PercentCapacity_c2

p1_7m_timesSelected_c2

p1_7m_timeWithoutSufficientFood_c2

p1_7m_timeWithoutSufficientWater_c2

p1_7m_totalTimeFromAlertToSelect_c2

p1_7m_totalTimeNotViewed_c2

p1_7m_totalTimeViewed_c2

p1_7m_clinicName_c3

p1_7m_cured_c3

p1_7m_deaths_c3

p1_7m_deliveredAntivirals_c3

p1_7m_deliveredFood_c3

p1_7m_deliveredWater_c3

p1_7m_phaseOneInfections_c3

p1_7m_phaseTwoInfections_c3

p1_7m_phaseThreeInfections_c3

p1_7m_sentAntivirals_c3

p1_7m_sentFood_c3

p1_7m_sentWater_c3

p1_7m_state_c3

p1_7m_timeOver100PercentCapacity_c3

p1_7m_timeOver75PercentCapacity_c3

p1_7m_timeOver50PercentCapacity_c3

p1_7m_timesSelected_c3

p1_7m_timeWithoutSufficientFood_c3

p1_7m_timeWithoutSufficientWater_c3

p1_7m_totalTimeFromAlertToSelect_c3

p1_7m_totalTimeNotViewed_c3

p1_7m_totalTimeViewed_c3

p1_7m_clinicName_c4

p1_7m_cured_c4

p1_7m_deaths_c4

p1_7m_deliveredAntivirals_c4

p1_7m_deliveredFood_c4

p1_7m_deliveredWater_c4

p1_7m_phaseOneInfections_c4

p1_7m_phaseTwoInfections_c4

p1_7m_phaseThreeInfections_c4

p1_7m_sentAntivirals_c4

p1_7m_sentFood_c4

p1_7m_sentWater_c4

p1_7m_state_c4

p1_7m_timeOver100PercentCapacity_c4

p1_7m_timeOver75PercentCapacity_c4

p1_7m_timeOver50PercentCapacity_c4

p1_7m_timesSelected_c4

p1_7m_timeWithoutSufficientFood_c4

p1_7m_timeWithoutSufficientWater_c4

p1_7m_totalTimeFromAlertToSelect_c4

p1_7m_totalTimeNotViewed_c4

p1_7m_totalTimeViewed_c4

PHASE 2, 5 MINUTES IN

State of core loop metrics 5 minutes into Phase Two. Includes data for 7 total clinics and the headquarters.

p2_5m_averageClinicTimeNotViewed

p2_5m_averageClinicTimeViewed

p2_5m_averageHelicopterLoadCapacity

p2_5m_averageTruckLoadCapacity

p2_5m_helicoptersOver75PercentCapacity

p2_5m_trucksOver75PercentCapacity

p2_5m_totalHelicoptersDispatched

p2_5m_totalTrucksDispatched

p2_5m_timeStamp

p2_5m_clinicName_c1

p2_5m_cured_c1

p2_5m_deaths_c1

p2_5m_deliveredAntivirals_c1

p2_5m_deliveredFood_c1

p2_5m_deliveredWater_c1

p2_5m_phaseOneInfections_c1

p2_5m_phaseTwoInfections_c1

p2_5m_phaseThreeInfections_c1

p2_5m_sentAntivirals_c1

p2_5m_sentFood_c1

p2_5m_sentWater_c1

p2_5m_state_c1

p2_5m_timeOver100PercentCapacity_c1

p2_5m_timeOver75PercentCapacity_c1

p2_5m_timeOver50PercentCapacity_c1

p2_5m_timesSelected_c1

p2_5m_timeWithoutSufficientFood_c1

p2_5m_timeWithoutSufficientWater_c1

p2_5m_totalTimeFromAlertToSelect_c1

p2_5m_totalTimeNotViewed_c1

p2_5m_totalTimeViewed_c1

p2_5m_clinicName_c2

p2_5m_cured_c2

p2_5m_deaths_c2

p2_5m_deliveredAntivirals_c2

p2_5m_deliveredFood_c2

p2_5m_deliveredWater_c2

p2_5m_phaseOneInfections_c2

p2_5m_phaseTwoInfections_c2

p2_5m_phaseThreeInfections_c2

p2_5m_sentAntivirals_c2

p2_5m_sentFood_c2

p2_5m_sentWater_c2

p2_5m_state_c2

p2_5m_timeOver100PercentCapacity_c2

p2_5m_timeOver75PercentCapacity_c2

p2_5m_timeOver50PercentCapacity_c2

p2_5m_timesSelected_c2

p2_5m_timeWithoutSufficientFood_c2

p2_5m_timeWithoutSufficientWater_c2

p2_5m_totalTimeFromAlertToSelect_c2

p2_5m_totalTimeNotViewed_c2

p2_5m_totalTimeViewed_c2

p2_5m_clinicName_c3

p2_5m_cured_c3

p2_5m_deaths_c3

p2_5m_deliveredAntivirals_c3

p2_5m_deliveredFood_c3

p2_5m_deliveredWater_c3

p2_5m_phaseOneInfections_c3

p2_5m_phaseTwoInfections_c3

p2_5m_phaseThreeInfections_c3

p2_5m_sentAntivirals_c3

p2_5m_sentFood_c3

p2_5m_sentWater_c3

p2_5m_state_c3

p2_5m_timeOver100PercentCapacity_c3

p2_5m_timeOver75PercentCapacity_c3

p2_5m_timeOver50PercentCapacity_c3

p2_5m_timesSelected_c3

p2_5m_timeWithoutSufficientFood_c3

p2_5m_timeWithoutSufficientWater_c3

p2_5m_totalTimeFromAlertToSelect_c3

p2_5m_totalTimeNotViewed_c3

p2_5m_totalTimeViewed_c3

p2_5m_clinicName_c4

p2_5m_cured_c4

p2_5m_deaths_c4

p2_5m_deliveredAntivirals_c4

p2_5m_deliveredFood_c4

p2_5m_deliveredWater_c4

p2_5m_phaseOneInfections_c4

p2_5m_phaseTwoInfections_c4

p2_5m_phaseThreeInfections_c4

p2_5m_sentAntivirals_c4

p2_5m_sentFood_c4

p2_5m_sentWater_c4

p2_5m_state_c4

p2_5m_timeOver100PercentCapacity_c4

p2_5m_timeOver75PercentCapacity_c4

p2_5m_timeOver50PercentCapacity_c4

p2_5m_timesSelected_c4

p2_5m_timeWithoutSufficientFood_c4

p2_5m_timeWithoutSufficientWater_c4

p2_5m_totalTimeFromAlertToSelect_c4

p2_5m_totalTimeNotViewed_c4

p2_5m_totalTimeViewed_c4

p2_5m_clinicName_c5

p2_5m_cured_c5

p2_5m_deaths_c5

p2_5m_deliveredAntivirals_c5

p2_5m_deliveredFood_c5

p2_5m_deliveredWater_c5

p2_5m_phaseOneInfections_c5

p2_5m_phaseTwoInfections_c5

p2_5m_phaseThreeInfections_c5

p2_5m_sentAntivirals_c5

p2_5m_sentFood_c5

p2_5m_sentWater_c5

p2_5m_state_c5

p2_5m_timeOver100PercentCapacity_c5

p2_5m_timeOver75PercentCapacity_c5

p2_5m_timeOver50PercentCapacity_c5

p2_5m_timesSelected_c5

p2_5m_timeWithoutSufficientFood_c5

p2_5m_timeWithoutSufficientWater_c5

p2_5m_totalTimeFromAlertToSelect_c5

p2_5m_totalTimeNotViewed_c5

p2_5m_totalTimeViewed_c5

p2_5m_clinicName_c6

p2_5m_cured_c6

p2_5m_deaths_c6

p2_5m_deliveredAntivirals_c6

p2_5m_deliveredFood_c6

p2_5m_deliveredWater_c6

p2_5m_phaseOneInfections_c6

p2_5m_phaseTwoInfections_c6

p2_5m_phaseThreeInfections_c6

p2_5m_sentAntivirals_c6

p2_5m_sentFood_c6

p2_5m_sentWater_c6

p2_5m_state_c6

p2_5m_timeOver100PercentCapacity_c6

p2_5m_timeOver75PercentCapacity_c6

p2_5m_timeOver50PercentCapacity_c6

p2_5m_timesSelected_c6

p2_5m_timeWithoutSufficientFood_c6

p2_5m_timeWithoutSufficientWater_c6

p2_5m_totalTimeFromAlertToSelect_c6

p2_5m_totalTimeNotViewed_c6

p2_5m_totalTimeViewed_c6

p2_5m_clinicName_c7

p2_5m_cured_c7

p2_5m_deaths_c7

p2_5m_deliveredAntivirals_c7

p2_5m_deliveredFood_c7

p2_5m_deliveredWater_c7

p2_5m_phaseOneInfections_c7

p2_5m_phaseTwoInfections_c7

p2_5m_phaseThreeInfections_c7

p2_5m_sentAntivirals_c7

p2_5m_sentFood_c7

p2_5m_sentWater_c7

p2_5m_state_c7

p2_5m_timeOver100PercentCapacity_c7

p2_5m_timeOver75PercentCapacity_c7

p2_5m_timeOver50PercentCapacity_c7

p2_5m_timesSelected_c7

p2_5m_timeWithoutSufficientFood_c7

p2_5m_timeWithoutSufficientWater_c7

p2_5m_totalTimeFromAlertToSelect_c7

p2_5m_totalTimeNotViewed_c7

p2_5m_totalTimeViewed_c7

PHASE 2, 6 MINUTES IN

State of core loop metrics 6 minutes into Phase 2. Includes data for 7 total clinics and the headquarters.

p2_6m_averageClinicTimeNotViewed

p2_6m_averageClinicTimeViewed

p2_6m_averageHelicopterLoadCapacity

p2_6m_averageTruckLoadCapacity

p2_6m_helicoptersOver75PercentCapacity

p2_6m_trucksOver75PercentCapacity

p2_6m_totalHelicoptersDispatched

p2_6m_totalTrucksDispatched

p2_6m_timeStamp

p2_6m_clinicName_c1

p2_6m_cured_c1

p2_6m_deaths_c1

p2_6m_deliveredAntivirals_c1

p2_6m_deliveredFood_c1

p2_6m_deliveredWater_c1

p2_6m_phaseOneInfections_c1

p2_6m_phaseTwoInfections_c1

p2_6m_phaseThreeInfections_c1

p2_6m_sentAntivirals_c1

p2_6m_sentFood_c1

p2_6m_sentWater_c1

p2_6m_state_c1

p2_6m_timeOver100PercentCapacity_c1

p2_6m_timeOver75PercentCapacity_c1

p2_6m_timeOver50PercentCapacity_c1

p2_6m_timesSelected_c1

p2_6m_timeWithoutSufficientFood_c1

p2_6m_timeWithoutSufficientWater_c1

p2_6m_totalTimeFromAlertToSelect_c1

p2_6m_totalTimeNotViewed_c1

p2_6m_totalTimeViewed_c1

p2_6m_clinicName_c2

p2_6m_cured_c2

p2_6m_deaths_c2

p2_6m_deliveredAntivirals_c2

p2_6m_deliveredFood_c2

p2_6m_deliveredWater_c2

p2_6m_phaseOneInfections_c2

p2_6m_phaseTwoInfections_c2

p2_6m_phaseThreeInfections_c2

p2_6m_sentAntivirals_c2

p2_6m_sentFood_c2

p2_6m_sentWater_c2

p2_6m_state_c2

p2_6m_timeOver100PercentCapacity_c2

p2_6m_timeOver75PercentCapacity_c2

p2_6m_timeOver50PercentCapacity_c2

p2_6m_timesSelected_c2

p2_6m_timeWithoutSufficientFood_c2

p2_6m_timeWithoutSufficientWater_c2

p2_6m_totalTimeFromAlertToSelect_c2

p2_6m_totalTimeNotViewed_c2

p2_6m_totalTimeViewed_c2

p2_6m_clinicName_c3

p2_6m_cured_c3

p2_6m_deaths_c3

p2_6m_deliveredAntivirals_c3

p2_6m_deliveredFood_c3

p2_6m_deliveredWater_c3

p2_6m_phaseOneInfections_c3

p2_6m_phaseTwoInfections_c3

p2_6m_phaseThreeInfections_c3

p2_6m_sentAntivirals_c3

p2_6m_sentFood_c3

p2_6m_sentWater_c3

p2_6m_state_c3

p2_6m_timeOver100PercentCapacity_c3

p2_6m_timeOver75PercentCapacity_c3

p2_6m_timeOver50PercentCapacity_c3

p2_6m_timesSelected_c3

p2_6m_timeWithoutSufficientFood_c3

p2_6m_timeWithoutSufficientWater_c3

p2_6m_totalTimeFromAlertToSelect_c3

p2_6m_totalTimeNotViewed_c3

p2_6m_totalTimeViewed_c3

p2_6m_clinicName_c4

p2_6m_cured_c4

p2_6m_deaths_c4

p2_6m_deliveredAntivirals_c4

p2_6m_deliveredFood_c4

p2_6m_deliveredWater_c4

p2_6m_phaseOneInfections_c4

p2_6m_phaseTwoInfections_c4

p2_6m_phaseThreeInfections_c4

p2_6m_sentAntivirals_c4

p2_6m_sentFood_c4

p2_6m_sentWater_c4

p2_6m_state_c4

p2_6m_timeOver100PercentCapacity_c4

p2_6m_timeOver75PercentCapacity_c4

p2_6m_timeOver50PercentCapacity_c4

p2_6m_timesSelected_c4

p2_6m_timeWithoutSufficientFood_c4

p2_6m_timeWithoutSufficientWater_c4

p2_6m_totalTimeFromAlertToSelect_c4

p2_6m_totalTimeNotViewed_c4

p2_6m_totalTimeViewed_c4

p2_6m_clinicName_c5

p2_6m_cured_c5

p2_6m_deaths_c5

p2_6m_deliveredAntivirals_c5

p2_6m_deliveredFood_c5

p2_6m_deliveredWater_c5

p2_6m_phaseOneInfections_c5

p2_6m_phaseTwoInfections_c5

p2_6m_phaseThreeInfections_c5

p2_6m_sentAntivirals_c5

p2_6m_sentFood_c5

p2_6m_sentWater_c5

p2_6m_state_c5

p2_6m_timeOver100PercentCapacity_c5

p2_6m_timeOver75PercentCapacity_c5

p2_6m_timeOver50PercentCapacity_c5

p2_6m_timesSelected_c5

p2_6m_timeWithoutSufficientFood_c5

p2_6m_timeWithoutSufficientWater_c5

p2_6m_totalTimeFromAlertToSelect_c5

p2_6m_totalTimeNotViewed_c5

p2_6m_totalTimeViewed_c5

p2_6m_clinicName_c6

p2_6m_cured_c6

p2_6m_deaths_c6

p2_6m_deliveredAntivirals_c6

p2_6m_deliveredFood_c6

p2_6m_deliveredWater_c6

p2_6m_phaseOneInfections_c6

p2_6m_phaseTwoInfections_c6

p2_6m_phaseThreeInfections_c6

p2_6m_sentAntivirals_c6

p2_6m_sentFood_c6

p2_6m_sentWater_c6

p2_6m_state_c6

p2_6m_timeOver100PercentCapacity_c6

p2_6m_timeOver75PercentCapacity_c6

p2_6m_timeOver50PercentCapacity_c6

p2_6m_timesSelected_c6

p2_6m_timeWithoutSufficientFood_c6

p2_6m_timeWithoutSufficientWater_c6

p2_6m_totalTimeFromAlertToSelect_c6

p2_6m_totalTimeNotViewed_c6

p2_6m_totalTimeViewed_c6

p2_6m_clinicName_c7

p2_6m_cured_c7

p2_6m_deaths_c7

p2_6m_deliveredAntivirals_c7

p2_6m_deliveredFood_c7

p2_6m_deliveredWater_c7

p2_6m_phaseOneInfections_c7

p2_6m_phaseTwoInfections_c7

p2_6m_phaseThreeInfections_c7

p2_6m_sentAntivirals_c7

p2_6m_sentFood_c7

p2_6m_sentWater_c7

p2_6m_state_c7

p2_6m_timeOver100PercentCapacity_c7

p2_6m_timeOver75PercentCapacity_c7

p2_6m_timeOver50PercentCapacity_c7

p2_6m_timesSelected_c7

p2_6m_timeWithoutSufficientFood_c7

p2_6m_timeWithoutSufficientWater_c7

p2_6m_totalTimeFromAlertToSelect_c7

p2_6m_totalTimeNotViewed_c7

p2_6m_totalTimeViewed_c7

PHASE 2, 7 MINUTES IN

State of core loop metrics 7 minutes into Phase Two. Includes data for 7 total clinics and the headquarters.

p2_7m_averageClinicTimeNotViewed

p2_7m_averageClinicTimeViewed

p2_7m_averageHelicopterLoadCapacity

p2_7m_averageTruckLoadCapacity

p2_7m_helicoptersOver75PercentCapacity

p2_7m_trucksOver75PercentCapacity

p2_7m_totalHelicoptersDispatched

p2_7m_totalTrucksDispatched

p2_7m_timeStamp

p2_7m_clinicName_c1

p2_7m_cured_c1

p2_7m_deaths_c1

p2_7m_deliveredAntivirals_c1

p2_7m_deliveredFood_c1

p2_7m_deliveredWater_c1

p2_7m_phaseOneInfections_c1

p2_7m_phaseTwoInfections_c1

p2_7m_phaseThreeInfections_c1

p2_7m_sentAntivirals_c1

p2_7m_sentFood_c1

p2_7m_sentWater_c1

p2_7m_state_c1

p2_7m_timeOver100PercentCapacity_c1

p2_7m_timeOver75PercentCapacity_c1

p2_7m_timeOver50PercentCapacity_c1

p2_7m_timesSelected_c1

p2_7m_timeWithoutSufficientFood_c1

p2_7m_timeWithoutSufficientWater_c1

p2_7m_totalTimeFromAlertToSelect_c1

p2_7m_totalTimeNotViewed_c1

p2_7m_totalTimeViewed_c1

p2_7m_clinicName_c2

p2_7m_cured_c2

p2_7m_deaths_c2

p2_7m_deliveredAntivirals_c2

p2_7m_deliveredFood_c2

p2_7m_deliveredWater_c2

p2_7m_phaseOneInfections_c2

p2_7m_phaseTwoInfections_c2

p2_7m_phaseThreeInfections_c2

p2_7m_sentAntivirals_c2

p2_7m_sentFood_c2

p2_7m_sentWater_c2

p2_7m_state_c2

p2_7m_timeOver100PercentCapacity_c2

p2_7m_timeOver75PercentCapacity_c2

p2_7m_timeOver50PercentCapacity_c2

p2_7m_timesSelected_c2

p2_7m_timeWithoutSufficientFood_c2

p2_7m_timeWithoutSufficientWater_c2

p2_7m_totalTimeFromAlertToSelect_c2

p2_7m_totalTimeNotViewed_c2

p2_7m_totalTimeViewed_c2

p2_7m_clinicName_c3

p2_7m_cured_c3

p2_7m_deaths_c3

p2_7m_deliveredAntivirals_c3

p2_7m_deliveredFood_c3

p2_7m_deliveredWater_c3

p2_7m_phaseOneInfections_c3

p2_7m_phaseTwoInfections_c3

p2_7m_phaseThreeInfections_c3

p2_7m_sentAntivirals_c3

p2_7m_sentFood_c3

p2_7m_sentWater_c3

p2_7m_state_c3

p2_7m_timeOver100PercentCapacity_c3

p2_7m_timeOver75PercentCapacity_c3

p2_7m_timeOver50PercentCapacity_c3

p2_7m_timesSelected_c3

p2_7m_timeWithoutSufficientFood_c3

p2_7m_timeWithoutSufficientWater_c3

p2_7m_totalTimeFromAlertToSelect_c3

p2_7m_totalTimeNotViewed_c3

p2_7m_totalTimeViewed_c3

p2_7m_clinicName_c4

p2_7m_cured_c4

p2_7m_deaths_c4

p2_7m_deliveredAntivirals_c4

p2_7m_deliveredFood_c4

p2_7m_deliveredWater_c4

p2_7m_phaseOneInfections_c4

p2_7m_phaseTwoInfections_c4

p2_7m_phaseThreeInfections_c4

p2_7m_sentAntivirals_c4

p2_7m_sentFood_c4

p2_7m_sentWater_c4

p2_7m_state_c4

p2_7m_timeOver100PercentCapacity_c4

p2_7m_timeOver75PercentCapacity_c4

p2_7m_timeOver50PercentCapacity_c4

p2_7m_timesSelected_c4

p2_7m_timeWithoutSufficientFood_c4

p2_7m_timeWithoutSufficientWater_c4

p2_7m_totalTimeFromAlertToSelect_c4

p2_7m_totalTimeNotViewed_c4

p2_7m_totalTimeViewed_c4

p2_7m_clinicName_c5

p2_7m_cured_c5

p2_7m_deaths_c5

p2_7m_deliveredAntivirals_c5

p2_7m_deliveredFood_c5

p2_7m_deliveredWater_c5

p2_7m_phaseOneInfections_c5

p2_7m_phaseTwoInfections_c5

p2_7m_phaseThreeInfections_c5

p2_7m_sentAntivirals_c5

p2_7m_sentFood_c5

p2_7m_sentWater_c5

p2_7m_state_c5

p2_7m_timeOver100PercentCapacity_c5

p2_7m_timeOver75PercentCapacity_c5

p2_7m_timeOver50PercentCapacity_c5

p2_7m_timesSelected_c5

p2_7m_timeWithoutSufficientFood_c5

p2_7m_timeWithoutSufficientWater_c5

p2_7m_totalTimeFromAlertToSelect_c5

p2_7m_totalTimeNotViewed_c5

p2_7m_totalTimeViewed_c5

p2_7m_clinicName_c6

p2_7m_cured_c6

p2_7m_deaths_c6

p2_7m_deliveredAntivirals_c6

p2_7m_deliveredFood_c6

p2_7m_deliveredWater_c6

p2_7m_phaseOneInfections_c6

p2_7m_phaseTwoInfections_c6

p2_7m_phaseThreeInfections_c6

p2_7m_sentAntivirals_c6

p2_7m_sentFood_c6

p2_7m_sentWater_c6

p2_7m_state_c6

p2_7m_timeOver100PercentCapacity_c6

p2_7m_timeOver75PercentCapacity_c6

p2_7m_timeOver50PercentCapacity_c6

p2_7m_timesSelected_c6

p2_7m_timeWithoutSufficientFood_c6

p2_7m_timeWithoutSufficientWater_c6

p2_7m_totalTimeFromAlertToSelect_c6

p2_7m_totalTimeNotViewed_c6

p2_7m_totalTimeViewed_c6

p2_7m_clinicName_c7

p2_7m_cured_c7

p2_7m_deaths_c7

p2_7m_deliveredAntivirals_c7

p2_7m_deliveredFood_c7

p2_7m_deliveredWater_c7

p2_7m_phaseOneInfections_c7

p2_7m_phaseTwoInfections_c7

p2_7m_phaseThreeInfections_c7

p2_7m_sentAntivirals_c7

p2_7m_sentFood_c7

p2_7m_sentWater_c7

p2_7m_state_c7

p2_7m_timeOver100PercentCapacity_c7

p2_7m_timeOver75PercentCapacity_c7

p2_7m_timeOver50PercentCapacity_c7

p2_7m_timesSelected_c7

p2_7m_timeWithoutSufficientFood_c7

p2_7m_timeWithoutSufficientWater_c7

p2_7m_totalTimeFromAlertToSelect_c7

p2_7m_totalTimeNotViewed_c7

p2_7m_totalTimeViewed_c7

PHASE 3, 5 MINUTES IN

State of core loop metrics 5 minutes into Phase 3. Includes data for 12 total clinics and the headquarters.

p3_5m_averageClinicTimeNotViewed

p3_5m_averageClinicTimeViewed

p3_5m_averageHelicopterLoadCapacity

p3_5m_averageTruckLoadCapacity

p3_5m_helicoptersOver75PercentCapacity

p3_5m_trucksOver75PercentCapacity

p3_5m_totalHelicoptersDispatched

p3_5m_totalTrucksDispatched

p3_5m_timeStamp

p3_5m_clinicName_c1

p3_5m_cured_c1

p3_5m_deaths_c1

p3_5m_deliveredAntivirals_c1

p3_5m_deliveredFood_c1

p3_5m_deliveredWater_c1

p3_5m_phaseOneInfections_c1

p3_5m_phaseTwoInfections_c1

p3_5m_phaseThreeInfections_c1

p3_5m_sentAntivirals_c1

p3_5m_sentFood_c1

p3_5m_sentWater_c1

p3_5m_state_c1

p3_5m_timeOver100PercentCapacity_c1

p3_5m_timeOver75PercentCapacity_c1

p3_5m_timeOver50PercentCapacity_c1

p3_5m_timesSelected_c1

p3_5m_timeWithoutSufficientFood_c1

p3_5m_timeWithoutSufficientWater_c1

p3_5m_totalTimeFromAlertToSelect_c1

p3_5m_totalTimeNotViewed_c1

p3_5m_totalTimeViewed_c1

p3_5m_clinicName_c2

p3_5m_cured_c2

p3_5m_deaths_c2

p3_5m_deliveredAntivirals_c2

p3_5m_deliveredFood_c2

p3_5m_deliveredWater_c2

p3_5m_phaseOneInfections_c2

p3_5m_phaseTwoInfections_c2

p3_5m_phaseThreeInfections_c2

p3_5m_sentAntivirals_c2

p3_5m_sentFood_c2

p3_5m_sentWater_c2

p3_5m_state_c2

p3_5m_timeOver100PercentCapacity_c2

p3_5m_timeOver75PercentCapacity_c2

p3_5m_timeOver50PercentCapacity_c2

p3_5m_timesSelected_c2

p3_5m_timeWithoutSufficientFood_c2

p3_5m_timeWithoutSufficientWater_c2

p3_5m_totalTimeFromAlertToSelect_c2

p3_5m_totalTimeNotViewed_c2

p3_5m_totalTimeViewed_c2

p3_5m_clinicName_c3

p3_5m_cured_c3

p3_5m_deaths_c3

p3_5m_deliveredAntivirals_c3

p3_5m_deliveredFood_c3

p3_5m_deliveredWater_c3

p3_5m_phaseOneInfections_c3

p3_5m_phaseTwoInfections_c3

p3_5m_phaseThreeInfections_c3

p3_5m_sentAntivirals_c3

p3_5m_sentFood_c3

p3_5m_sentWater_c3

p3_5m_state_c3

p3_5m_timeOver100PercentCapacity_c3

p3_5m_timeOver75PercentCapacity_c3

p3_5m_timeOver50PercentCapacity_c3

p3_5m_timesSelected_c3

p3_5m_timeWithoutSufficientFood_c3

p3_5m_timeWithoutSufficientWater_c3

p3_5m_totalTimeFromAlertToSelect_c3

p3_5m_totalTimeNotViewed_c3

p3_5m_totalTimeViewed_c3

p3_5m_clinicName_c4

p3_5m_cured_c4

p3_5m_deaths_c4

p3_5m_deliveredAntivirals_c4

p3_5m_deliveredFood_c4

p3_5m_deliveredWater_c4

p3_5m_phaseOneInfections_c4

p3_5m_phaseTwoInfections_c4

p3_5m_phaseThreeInfections_c4

p3_5m_sentAntivirals_c4

p3_5m_sentFood_c4

p3_5m_sentWater_c4

p3_5m_state_c4

p3_5m_timeOver100PercentCapacity_c4

p3_5m_timeOver75PercentCapacity_c4

p3_5m_timeOver50PercentCapacity_c4

p3_5m_timesSelected_c4

p3_5m_timeWithoutSufficientFood_c4

p3_5m_timeWithoutSufficientWater_c4

p3_5m_totalTimeFromAlertToSelect_c4

p3_5m_totalTimeNotViewed_c4

p3_5m_totalTimeViewed_c4

p3_5m_clinicName_c5

p3_5m_cured_c5

p3_5m_deaths_c5

p3_5m_deliveredAntivirals_c5

p3_5m_deliveredFood_c5

p3_5m_deliveredWater_c5

p3_5m_phaseOneInfections_c5

p3_5m_phaseTwoInfections_c5

p3_5m_phaseThreeInfections_c5

p3_5m_sentAntivirals_c5

p3_5m_sentFood_c5

p3_5m_sentWater_c5

p3_5m_state_c5

p3_5m_timeOver100PercentCapacity_c5

p3_5m_timeOver75PercentCapacity_c5

p3_5m_timeOver50PercentCapacity_c5

p3_5m_timesSelected_c5

p3_5m_timeWithoutSufficientFood_c5

p3_5m_timeWithoutSufficientWater_c5

p3_5m_totalTimeFromAlertToSelect_c5

p3_5m_totalTimeNotViewed_c5

p3_5m_totalTimeViewed_c5

p3_5m_clinicName_c6

p3_5m_cured_c6

p3_5m_deaths_c6

p3_5m_deliveredAntivirals_c6

p3_5m_deliveredFood_c6

p3_5m_deliveredWater_c6

p3_5m_phaseOneInfections_c6

p3_5m_phaseTwoInfections_c6

p3_5m_phaseThreeInfections_c6

p3_5m_sentAntivirals_c6

p3_5m_sentFood_c6

p3_5m_sentWater_c6

p3_5m_state_c6

p3_5m_timeOver100PercentCapacity_c6

p3_5m_timeOver75PercentCapacity_c6

p3_5m_timeOver50PercentCapacity_c6

p3_5m_timesSelected_c6

p3_5m_timeWithoutSufficientFood_c6

p3_5m_timeWithoutSufficientWater_c6

p3_5m_totalTimeFromAlertToSelect_c6

p3_5m_totalTimeNotViewed_c6

p3_5m_totalTimeViewed_c6

p3_5m_clinicName_c7

p3_5m_cured_c7

p3_5m_deaths_c7

p3_5m_deliveredAntivirals_c7

p3_5m_deliveredFood_c7

p3_5m_deliveredWater_c7

p3_5m_phaseOneInfections_c7

p3_5m_phaseTwoInfections_c7

p3_5m_phaseThreeInfections_c7

p3_5m_sentAntivirals_c7

p3_5m_sentFood_c7

p3_5m_sentWater_c7

p3_5m_state_c7

p3_5m_timeOver100PercentCapacity_c7

p3_5m_timeOver75PercentCapacity_c7

p3_5m_timeOver50PercentCapacity_c7

p3_5m_timesSelected_c7

p3_5m_timeWithoutSufficientFood_c7

p3_5m_timeWithoutSufficientWater_c7

p3_5m_totalTimeFromAlertToSelect_c7

p3_5m_totalTimeNotViewed_c7

p3_5m_totalTimeViewed_c7

p3_5m_clinicName_c8

p3_5m_cured_c8

p3_5m_deaths_c8

p3_5m_deliveredAntivirals_c8

p3_5m_deliveredFood_c8

p3_5m_deliveredWater_c8

p3_5m_phaseOneInfections_c8

p3_5m_phaseTwoInfections_c8

p3_5m_phaseThreeInfections_c8

p3_5m_sentAntivirals_c8

p3_5m_sentFood_c8

p3_5m_sentWater_c8

p3_5m_state_c8

p3_5m_timeOver100PercentCapacity_c8

p3_5m_timeOver75PercentCapacity_c8

p3_5m_timeOver50PercentCapacity_c8

p3_5m_timesSelected_c8

p3_5m_timeWithoutSufficientFood_c8

p3_5m_timeWithoutSufficientWater_c8

p3_5m_totalTimeFromAlertToSelect_c8

p3_5m_totalTimeNotViewed_c8

p3_5m_totalTimeViewed_c8

p3_5m_clinicName_c9

p3_5m_cured_c9

p3_5m_deaths_c9

p3_5m_deliveredAntivirals_c9

p3_5m_deliveredFood_c9

p3_5m_deliveredWater_c9

p3_5m_phaseOneInfections_c9

p3_5m_phaseTwoInfections_c9

p3_5m_phaseThreeInfections_c9

p3_5m_sentAntivirals_c9

p3_5m_sentFood_c9

p3_5m_sentWater_c9

p3_5m_state_c9

p3_5m_timeOver100PercentCapacity_c9

p3_5m_timeOver75PercentCapacity_c9

p3_5m_timeOver50PercentCapacity_c9

p3_5m_timesSelected_c9

p3_5m_timeWithoutSufficientFood_c9

p3_5m_timeWithoutSufficientWater_c9

p3_5m_totalTimeFromAlertToSelect_c9

p3_5m_totalTimeNotViewed_c9

p3_5m_totalTimeViewed_c9

p3_5m_clinicName_c10

p3_5m_cured_c10

p3_5m_deaths_c10

p3_5m_deliveredAntivirals_c10

p3_5m_deliveredFood_c10

p3_5m_deliveredWater_c10

p3_5m_phaseOneInfections_c10

p3_5m_phaseTwoInfections_c10

p3_5m_phaseThreeInfections_c10

p3_5m_sentAntivirals_c10

p3_5m_sentFood_c10

p3_5m_sentWater_c10

p3_5m_state_c10

p3_5m_timeOver100PercentCapacity_c10

p3_5m_timeOver75PercentCapacity_c10

p3_5m_timeOver50PercentCapacity_c10

p3_5m_timesSelected_c10

p3_5m_timeWithoutSufficientFood_c10

p3_5m_timeWithoutSufficientWater_c10

p3_5m_totalTimeFromAlertToSelect_c10

p3_5m_totalTimeNotViewed_c10

p3_5m_totalTimeViewed_c10

p3_5m_clinicName_c11

p3_5m_cured_c11

p3_5m_deaths_c11

p3_5m_deliveredAntivirals_c11

p3_5m_deliveredFood_c11

p3_5m_deliveredWater_c11

p3_5m_phaseOneInfections_c11

p3_5m_phaseTwoInfections_c11

p3_5m_phaseThreeInfections_c11

p3_5m_sentAntivirals_c11

p3_5m_sentFood_c11

p3_5m_sentWater_c11

p3_5m_state_c11

p3_5m_timeOver100PercentCapacity_c11

p3_5m_timeOver75PercentCapacity_c11

p3_5m_timeOver50PercentCapacity_c11

p3_5m_timesSelected_c11

p3_5m_timeWithoutSufficientFood_c11

p3_5m_timeWithoutSufficientWater_c11

p3_5m_totalTimeFromAlertToSelect_c11

p3_5m_totalTimeNotViewed_c11

p3_5m_totalTimeViewed_c11

p3_5m_clinicName_c12

p3_5m_cured_c12

p3_5m_deaths_c12

p3_5m_deliveredAntivirals_c12

p3_5m_deliveredFood_c12

p3_5m_deliveredWater_c12

p3_5m_phaseOneInfections_c12

p3_5m_phaseTwoInfections_c12

p3_5m_phaseThreeInfections_c12

p3_5m_sentAntivirals_c12

p3_5m_sentFood_c12

p3_5m_sentWater_c12

p3_5m_state_c12

p3_5m_timeOver100PercentCapacity_c12

p3_5m_timeOver75PercentCapacity_c12

p3_5m_timeOver50PercentCapacity_c12

p3_5m_timesSelected_c12

p3_5m_timeWithoutSufficientFood_c12

p3_5m_timeWithoutSufficientWater_c12

p3_5m_totalTimeFromAlertToSelect_c12

p3_5m_totalTimeNotViewed_c12

p3_5m_totalTimeViewed_c12

PHASE 3, 6 MINUTES IN

State of core loop metrics 6 minutes into Phase 3. Includes data for 12 total clinics and the headquarters.

p3_6m_averageClinicTimeNotViewed

p3_6m_averageClinicTimeViewed

p3_6m_averageHelicopterLoadCapacity

p3_6m_averageTruckLoadCapacity

p3_6m_helicoptersOver75PercentCapacity

p3_6m_trucksOver75PercentCapacity

p3_6m_totalHelicoptersDispatched

p3_6m_totalTrucksDispatched

p3_6m_timeStamp

p3_6m_clinicName_c1

p3_6m_cured_c1

p3_6m_deaths_c1

p3_6m_deliveredAntivirals_c1

p3_6m_deliveredFood_c1

p3_6m_deliveredWater_c1

p3_6m_phaseOneInfections_c1

p3_6m_phaseTwoInfections_c1

p3_6m_phaseThreeInfections_c1

p3_6m_sentAntivirals_c1

p3_6m_sentFood_c1

p3_6m_sentWater_c1

p3_6m_state_c1

p3_6m_timeOver100PercentCapacity_c1

p3_6m_timeOver75PercentCapacity_c1

p3_6m_timeOver50PercentCapacity_c1

p3_6m_timesSelected_c1

p3_6m_timeWithoutSufficientFood_c1

p3_6m_timeWithoutSufficientWater_c1

p3_6m_totalTimeFromAlertToSelect_c1

p3_6m_totalTimeNotViewed_c1

p3_6m_totalTimeViewed_c1

p3_6m_clinicName_c2

p3_6m_cured_c2

p3_6m_deaths_c2

p3_6m_deliveredAntivirals_c2

p3_6m_deliveredFood_c2

p3_6m_deliveredWater_c2

p3_6m_phaseOneInfections_c2

p3_6m_phaseTwoInfections_c2

p3_6m_phaseThreeInfections_c2

p3_6m_sentAntivirals_c2

p3_6m_sentFood_c2

p3_6m_sentWater_c2

p3_6m_state_c2

p3_6m_timeOver100PercentCapacity_c2

p3_6m_timeOver75PercentCapacity_c2

p3_6m_timeOver50PercentCapacity_c2

p3_6m_timesSelected_c2

p3_6m_timeWithoutSufficientFood_c2

p3_6m_timeWithoutSufficientWater_c2

p3_6m_totalTimeFromAlertToSelect_c2

p3_6m_totalTimeNotViewed_c2

p3_6m_totalTimeViewed_c2

p3_6m_clinicName_c3

p3_6m_cured_c3

p3_6m_deaths_c3

p3_6m_deliveredAntivirals_c3

p3_6m_deliveredFood_c3

p3_6m_deliveredWater_c3

p3_6m_phaseOneInfections_c3

p3_6m_phaseTwoInfections_c3

p3_6m_phaseThreeInfections_c3

p3_6m_sentAntivirals_c3

p3_6m_sentFood_c3

p3_6m_sentWater_c3

p3_6m_state_c3

p3_6m_timeOver100PercentCapacity_c3

p3_6m_timeOver75PercentCapacity_c3

p3_6m_timeOver50PercentCapacity_c3

p3_6m_timesSelected_c3

p3_6m_timeWithoutSufficientFood_c3

p3_6m_timeWithoutSufficientWater_c3

p3_6m_totalTimeFromAlertToSelect_c3

p3_6m_totalTimeNotViewed_c3

p3_6m_totalTimeViewed_c3

p3_6m_clinicName_c4

p3_6m_cured_c4

p3_6m_deaths_c4

p3_6m_deliveredAntivirals_c4

p3_6m_deliveredFood_c4

p3_6m_deliveredWater_c4

p3_6m_phaseOneInfections_c4

p3_6m_phaseTwoInfections_c4

p3_6m_phaseThreeInfections_c4

p3_6m_sentAntivirals_c4

p3_6m_sentFood_c4

p3_6m_sentWater_c4

p3_6m_state_c4

p3_6m_timeOver100PercentCapacity_c4

p3_6m_timeOver75PercentCapacity_c4

p3_6m_timeOver50PercentCapacity_c4

p3_6m_timesSelected_c4

p3_6m_timeWithoutSufficientFood_c4

p3_6m_timeWithoutSufficientWater_c4

p3_6m_totalTimeFromAlertToSelect_c4

p3_6m_totalTimeNotViewed_c4

p3_6m_totalTimeViewed_c4

p3_6m_clinicName_c5

p3_6m_cured_c5

p3_6m_deaths_c5

p3_6m_deliveredAntivirals_c5

p3_6m_deliveredFood_c5

p3_6m_deliveredWater_c5

p3_6m_phaseOneInfections_c5

p3_6m_phaseTwoInfections_c5

p3_6m_phaseThreeInfections_c5

p3_6m_sentAntivirals_c5

p3_6m_sentFood_c5

p3_6m_sentWater_c5

p3_6m_state_c5

p3_6m_timeOver100PercentCapacity_c5

p3_6m_timeOver75PercentCapacity_c5

p3_6m_timeOver50PercentCapacity_c5

p3_6m_timesSelected_c5

p3_6m_timeWithoutSufficientFood_c5

p3_6m_timeWithoutSufficientWater_c5

p3_6m_totalTimeFromAlertToSelect_c5

p3_6m_totalTimeNotViewed_c5

p3_6m_totalTimeViewed_c5

p3_6m_clinicName_c6

p3_6m_cured_c6

p3_6m_deaths_c6

p3_6m_deliveredAntivirals_c6

p3_6m_deliveredFood_c6

p3_6m_deliveredWater_c6

p3_6m_phaseOneInfections_c6

p3_6m_phaseTwoInfections_c6

p3_6m_phaseThreeInfections_c6

p3_6m_sentAntivirals_c6

p3_6m_sentFood_c6

p3_6m_sentWater_c6

p3_6m_state_c6

p3_6m_timeOver100PercentCapacity_c6

p3_6m_timeOver75PercentCapacity_c6

p3_6m_timeOver50PercentCapacity_c6

p3_6m_timesSelected_c6

p3_6m_timeWithoutSufficientFood_c6

p3_6m_timeWithoutSufficientWater_c6

p3_6m_totalTimeFromAlertToSelect_c6

p3_6m_totalTimeNotViewed_c6

p3_6m_totalTimeViewed_c6

p3_6m_clinicName_c7

p3_6m_cured_c7

p3_6m_deaths_c7

p3_6m_deliveredAntivirals_c7

p3_6m_deliveredFood_c7

p3_6m_deliveredWater_c7

p3_6m_phaseOneInfections_c7

p3_6m_phaseTwoInfections_c7

p3_6m_phaseThreeInfections_c7

p3_6m_sentAntivirals_c7

p3_6m_sentFood_c7

p3_6m_sentWater_c7

p3_6m_state_c7

p3_6m_timeOver100PercentCapacity_c7

p3_6m_timeOver75PercentCapacity_c7

p3_6m_timeOver50PercentCapacity_c7

p3_6m_timesSelected_c7

p3_6m_timeWithoutSufficientFood_c7

p3_6m_timeWithoutSufficientWater_c7

p3_6m_totalTimeFromAlertToSelect_c7

p3_6m_totalTimeNotViewed_c7

p3_6m_totalTimeViewed_c7

p3_6m_clinicName_c8

p3_6m_cured_c8

p3_6m_deaths_c8

p3_6m_deliveredAntivirals_c8

p3_6m_deliveredFood_c8

p3_6m_deliveredWater_c8

p3_6m_phaseOneInfections_c8

p3_6m_phaseTwoInfections_c8

p3_6m_phaseThreeInfections_c8

p3_6m_sentAntivirals_c8

p3_6m_sentFood_c8

p3_6m_sentWater_c8

p3_6m_state_c8

p3_6m_timeOver100PercentCapacity_c8

p3_6m_timeOver75PercentCapacity_c8

p3_6m_timeOver50PercentCapacity_c8

p3_6m_timesSelected_c8

p3_6m_timeWithoutSufficientFood_c8

p3_6m_timeWithoutSufficientWater_c8

p3_6m_totalTimeFromAlertToSelect_c8

p3_6m_totalTimeNotViewed_c8

p3_6m_totalTimeViewed_c8

p3_6m_clinicName_c9

p3_6m_cured_c9

p3_6m_deaths_c9

p3_6m_deliveredAntivirals_c9

p3_6m_deliveredFood_c9

p3_6m_deliveredWater_c9

p3_6m_phaseOneInfections_c9

p3_6m_phaseTwoInfections_c9

p3_6m_phaseThreeInfections_c9

p3_6m_sentAntivirals_c9

p3_6m_sentFood_c9

p3_6m_sentWater_c9

p3_6m_state_c9

p3_6m_timeOver100PercentCapacity_c9

p3_6m_timeOver75PercentCapacity_c9

p3_6m_timeOver50PercentCapacity_c9

p3_6m_timesSelected_c9

p3_6m_timeWithoutSufficientFood_c9

p3_6m_timeWithoutSufficientWater_c9

p3_6m_totalTimeFromAlertToSelect_c9

p3_6m_totalTimeNotViewed_c9

p3_6m_totalTimeViewed_c9

p3_6m_clinicName_c10

p3_6m_cured_c10

p3_6m_deaths_c10

p3_6m_deliveredAntivirals_c10

p3_6m_deliveredFood_c10

p3_6m_deliveredWater_c10

p3_6m_phaseOneInfections_c10

p3_6m_phaseTwoInfections_c10

p3_6m_phaseThreeInfections_c10

p3_6m_sentAntivirals_c10

p3_6m_sentFood_c10

p3_6m_sentWater_c10

p3_6m_state_c10

p3_6m_timeOver100PercentCapacity_c10

p3_6m_timeOver75PercentCapacity_c10

p3_6m_timeOver50PercentCapacity_c10

p3_6m_timesSelected_c10

p3_6m_timeWithoutSufficientFood_c10

p3_6m_timeWithoutSufficientWater_c10

p3_6m_totalTimeFromAlertToSelect_c10

p3_6m_totalTimeNotViewed_c10

p3_6m_totalTimeViewed_c10

p3_6m_clinicName_c11

p3_6m_cured_c11

p3_6m_deaths_c11

p3_6m_deliveredAntivirals_c11

p3_6m_deliveredFood_c11

p3_6m_deliveredWater_c11

p3_6m_phaseOneInfections_c11

p3_6m_phaseTwoInfections_c11

p3_6m_phaseThreeInfections_c11

p3_6m_sentAntivirals_c11

p3_6m_sentFood_c11

p3_6m_sentWater_c11

p3_6m_state_c11

p3_6m_timeOver100PercentCapacity_c11

p3_6m_timeOver75PercentCapacity_c11

p3_6m_timeOver50PercentCapacity_c11

p3_6m_timesSelected_c11

p3_6m_timeWithoutSufficientFood_c11

p3_6m_timeWithoutSufficientWater_c11

p3_6m_totalTimeFromAlertToSelect_c11

p3_6m_totalTimeNotViewed_c11

p3_6m_totalTimeViewed_c11

p3_6m_clinicName_c12

p3_6m_cured_c12

p3_6m_deaths_c12

p3_6m_deliveredAntivirals_c12

p3_6m_deliveredFood_c12

p3_6m_deliveredWater_c12

p3_6m_phaseOneInfections_c12

p3_6m_phaseTwoInfections_c12

p3_6m_phaseThreeInfections_c12

p3_6m_sentAntivirals_c12

p3_6m_sentFood_c12

p3_6m_sentWater_c12

p3_6m_state_c12

p3_6m_timeOver100PercentCapacity_c12

p3_6m_timeOver75PercentCapacity_c12

p3_6m_timeOver50PercentCapacity_c12

p3_6m_timesSelected_c12

p3_6m_timeWithoutSufficientFood_c12

p3_6m_timeWithoutSufficientWater_c12

p3_6m_totalTimeFromAlertToSelect_c12

p3_6m_totalTimeNotViewed_c12

p3_6m_totalTimeViewed_c12

PHASE 3, 7 MINUTES IN

State of core loop metrics 7 minutes into Phase 3. Includes data for 12 total clinics and the headquarters.

p3_7m_averageClinicTimeNotViewed

p3_7m_averageClinicTimeViewed

p3_7m_averageHelicopterLoadCapacity

p3_7m_averageTruckLoadCapacity

p3_7m_helicoptersOver75PercentCapacity

p3_7m_trucksOver75PercentCapacity

p3_7m_totalHelicoptersDispatched

p3_7m_totalTrucksDispatched

p3_7m_timeStamp

p3_7m_clinicName_c1

p3_7m_cured_c1

p3_7m_deaths_c1

p3_7m_deliveredAntivirals_c1

p3_7m_deliveredFood_c1

p3_7m_deliveredWater_c1

p3_7m_phaseOneInfections_c1

p3_7m_phaseTwoInfections_c1

p3_7m_phaseThreeInfections_c1

p3_7m_sentAntivirals_c1

p3_7m_sentFood_c1

p3_7m_sentWater_c1

p3_7m_state_c1

p3_7m_timeOver100PercentCapacity_c1

p3_7m_timeOver75PercentCapacity_c1

p3_7m_timeOver50PercentCapacity_c1

p3_7m_timesSelected_c1

p3_7m_timeWithoutSufficientFood_c1

p3_7m_timeWithoutSufficientWater_c1

p3_7m_totalTimeFromAlertToSelect_c1

p3_7m_totalTimeNotViewed_c1

p3_7m_totalTimeViewed_c1

p3_7m_clinicName_c2

p3_7m_cured_c2

p3_7m_deaths_c2

p3_7m_deliveredAntivirals_c2

p3_7m_deliveredFood_c2

p3_7m_deliveredWater_c2

p3_7m_phaseOneInfections_c2

p3_7m_phaseTwoInfections_c2

p3_7m_phaseThreeInfections_c2

p3_7m_sentAntivirals_c2

p3_7m_sentFood_c2

p3_7m_sentWater_c2

p3_7m_state_c2

p3_7m_timeOver100PercentCapacity_c2

p3_7m_timeOver75PercentCapacity_c2

p3_7m_timeOver50PercentCapacity_c2

p3_7m_timesSelected_c2

p3_7m_timeWithoutSufficientFood_c2

p3_7m_timeWithoutSufficientWater_c2

p3_7m_totalTimeFromAlertToSelect_c2

p3_7m_totalTimeNotViewed_c2

p3_7m_totalTimeViewed_c2

p3_7m_clinicName_c3

p3_7m_cured_c3

p3_7m_deaths_c3

p3_7m_deliveredAntivirals_c3

p3_7m_deliveredFood_c3

p3_7m_deliveredWater_c3

p3_7m_phaseOneInfections_c3

p3_7m_phaseTwoInfections_c3

p3_7m_phaseThreeInfections_c3

p3_7m_sentAntivirals_c3

p3_7m_sentFood_c3

p3_7m_sentWater_c3

p3_7m_state_c3

p3_7m_timeOver100PercentCapacity_c3

p3_7m_timeOver75PercentCapacity_c3

p3_7m_timeOver50PercentCapacity_c3

p3_7m_timesSelected_c3

p3_7m_timeWithoutSufficientFood_c3

p3_7m_timeWithoutSufficientWater_c3

p3_7m_totalTimeFromAlertToSelect_c3

p3_7m_totalTimeNotViewed_c3

p3_7m_totalTimeViewed_c3

p3_7m_clinicName_c4

p3_7m_cured_c4

p3_7m_deaths_c4

p3_7m_deliveredAntivirals_c4

p3_7m_deliveredFood_c4

p3_7m_deliveredWater_c4

p3_7m_phaseOneInfections_c4

p3_7m_phaseTwoInfections_c4

p3_7m_phaseThreeInfections_c4

p3_7m_sentAntivirals_c4

p3_7m_sentFood_c4

p3_7m_sentWater_c4

p3_7m_state_c4

p3_7m_timeOver100PercentCapacity_c4

p3_7m_timeOver75PercentCapacity_c4

p3_7m_timeOver50PercentCapacity_c4

p3_7m_timesSelected_c4

p3_7m_timeWithoutSufficientFood_c4

p3_7m_timeWithoutSufficientWater_c4

p3_7m_totalTimeFromAlertToSelect_c4

p3_7m_totalTimeNotViewed_c4

p3_7m_totalTimeViewed_c4

p3_7m_clinicName_c5

p3_7m_cured_c5

p3_7m_deaths_c5

p3_7m_deliveredAntivirals_c5

p3_7m_deliveredFood_c5

p3_7m_deliveredWater_c5

p3_7m_phaseOneInfections_c5

p3_7m_phaseTwoInfections_c5

p3_7m_phaseThreeInfections_c5

p3_7m_sentAntivirals_c5

p3_7m_sentFood_c5

p3_7m_sentWater_c5

p3_7m_state_c5

p3_7m_timeOver100PercentCapacity_c5

p3_7m_timeOver75PercentCapacity_c5

p3_7m_timeOver50PercentCapacity_c5

p3_7m_timesSelected_c5

p3_7m_timeWithoutSufficientFood_c5

p3_7m_timeWithoutSufficientWater_c5

p3_7m_totalTimeFromAlertToSelect_c5

p3_7m_totalTimeNotViewed_c5

p3_7m_totalTimeViewed_c5

p3_7m_clinicName_c6

p3_7m_cured_c6

p3_7m_deaths_c6

p3_7m_deliveredAntivirals_c6

p3_7m_deliveredFood_c6

p3_7m_deliveredWater_c6

p3_7m_phaseOneInfections_c6

p3_7m_phaseTwoInfections_c6

p3_7m_phaseThreeInfections_c6

p3_7m_sentAntivirals_c6

p3_7m_sentFood_c6

p3_7m_sentWater_c6

p3_7m_state_c6

p3_7m_timeOver100PercentCapacity_c6

p3_7m_timeOver75PercentCapacity_c6

p3_7m_timeOver50PercentCapacity_c6

p3_7m_timesSelected_c6

p3_7m_timeWithoutSufficientFood_c6

p3_7m_timeWithoutSufficientWater_c6

p3_7m_totalTimeFromAlertToSelect_c6

p3_7m_totalTimeNotViewed_c6

p3_7m_totalTimeViewed_c6

p3_7m_clinicName_c7

p3_7m_cured_c7

p3_7m_deaths_c7

p3_7m_deliveredAntivirals_c7

p3_7m_deliveredFood_c7

p3_7m_deliveredWater_c7

p3_7m_phaseOneInfections_c7

p3_7m_phaseTwoInfections_c7

p3_7m_phaseThreeInfections_c7

p3_7m_sentAntivirals_c7

p3_7m_sentFood_c7

p3_7m_sentWater_c7

p3_7m_state_c7

p3_7m_timeOver100PercentCapacity_c7

p3_7m_timeOver75PercentCapacity_c7

p3_7m_timeOver50PercentCapacity_c7

p3_7m_timesSelected_c7

p3_7m_timeWithoutSufficientFood_c7

p3_7m_timeWithoutSufficientWater_c7

p3_7m_totalTimeFromAlertToSelect_c7

p3_7m_totalTimeNotViewed_c7

p3_7m_totalTimeViewed_c7

p3_7m_clinicName_c8

p3_7m_cured_c8

p3_7m_deaths_c8

p3_7m_deliveredAntivirals_c8

p3_7m_deliveredFood_c8

p3_7m_deliveredWater_c8

p3_7m_phaseOneInfections_c8

p3_7m_phaseTwoInfections_c8

p3_7m_phaseThreeInfections_c8

p3_7m_sentAntivirals_c8

p3_7m_sentFood_c8

p3_7m_sentWater_c8

p3_7m_state_c8

p3_7m_timeOver100PercentCapacity_c8

p3_7m_timeOver75PercentCapacity_c8

p3_7m_timeOver50PercentCapacity_c8

p3_7m_timesSelected_c8

p3_7m_timeWithoutSufficientFood_c8

p3_7m_timeWithoutSufficientWater_c8

p3_7m_totalTimeFromAlertToSelect_c8

p3_7m_totalTimeNotViewed_c8

p3_7m_totalTimeViewed_c8

p3_7m_clinicName_c9

p3_7m_cured_c9

p3_7m_deaths_c9

p3_7m_deliveredAntivirals_c9

p3_7m_deliveredFood_c9

p3_7m_deliveredWater_c9

p3_7m_phaseOneInfections_c9

p3_7m_phaseTwoInfections_c9

p3_7m_phaseThreeInfections_c9

p3_7m_sentAntivirals_c9

p3_7m_sentFood_c9

p3_7m_sentWater_c9

p3_7m_state_c9

p3_7m_timeOver100PercentCapacity_c9

p3_7m_timeOver75PercentCapacity_c9

p3_7m_timeOver50PercentCapacity_c9

p3_7m_timesSelected_c9

p3_7m_timeWithoutSufficientFood_c9

p3_7m_timeWithoutSufficientWater_c9

p3_7m_totalTimeFromAlertToSelect_c9

p3_7m_totalTimeNotViewed_c9

p3_7m_totalTimeViewed_c9

p3_7m_clinicName_c10

p3_7m_cured_c10

p3_7m_deaths_c10

p3_7m_deliveredAntivirals_c10

p3_7m_deliveredFood_c10

p3_7m_deliveredWater_c10

p3_7m_phaseOneInfections_c10

p3_7m_phaseTwoInfections_c10

p3_7m_phaseThreeInfections_c10

p3_7m_sentAntivirals_c10

p3_7m_sentFood_c10

p3_7m_sentWater_c10

p3_7m_state_c10

p3_7m_timeOver100PercentCapacity_c10

p3_7m_timeOver75PercentCapacity_c10

p3_7m_timeOver50PercentCapacity_c10

p3_7m_timesSelected_c10

p3_7m_timeWithoutSufficientFood_c10

p3_7m_timeWithoutSufficientWater_c10

p3_7m_totalTimeFromAlertToSelect_c10

p3_7m_totalTimeNotViewed_c10

p3_7m_totalTimeViewed_c10

p3_7m_clinicName_c11

p3_7m_cured_c11

p3_7m_deaths_c11

p3_7m_deliveredAntivirals_c11

p3_7m_deliveredFood_c11

p3_7m_deliveredWater_c11

p3_7m_phaseOneInfections_c11

p3_7m_phaseTwoInfections_c11

p3_7m_phaseThreeInfections_c11

p3_7m_sentAntivirals_c11

p3_7m_sentFood_c11

p3_7m_sentWater_c11

p3_7m_state_c11

p3_7m_timeOver100PercentCapacity_c11

p3_7m_timeOver75PercentCapacity_c11

p3_7m_timeOver50PercentCapacity_c11

p3_7m_timesSelected_c11

p3_7m_timeWithoutSufficientFood_c11

p3_7m_timeWithoutSufficientWater_c11

p3_7m_totalTimeFromAlertToSelect_c11

p3_7m_totalTimeNotViewed_c11

p3_7m_totalTimeViewed_c11

p3_7m_clinicName_c12

p3_7m_cured_c12

p3_7m_deaths_c12

p3_7m_deliveredAntivirals_c12

p3_7m_deliveredFood_c12

p3_7m_deliveredWater_c12

p3_7m_phaseOneInfections_c12

p3_7m_phaseTwoInfections_c12

p3_7m_phaseThreeInfections_c12

p3_7m_sentAntivirals_c12

p3_7m_sentFood_c12

p3_7m_sentWater_c12

p3_7m_state_c12

p3_7m_timeOver100PercentCapacity_c12

p3_7m_timeOver75PercentCapacity_c12

p3_7m_timeOver50PercentCapacity_c12

p3_7m_timesSelected_c12

p3_7m_timeWithoutSufficientFood_c12

p3_7m_timeWithoutSufficientWater_c12

p3_7m_totalTimeNotViewed_c12

p3_7m_totalTimeFromAlertToSelect_c12

p3_7m_totalTimeViewed_c12

MINI-GAME 1, 5 MINUTES IN VIRUS & LOGISTICS QUESTIONS

Data for 5 minutes of progress into virus and logistics question. The number completed out of 13 possible questions.

mg1_5m_virus_logistics_timeStamp

mg1_5m_virus_logistics_question1

mg1_5m_virus_logistics_answer1

mg1_5m_virus_logistics_answerTimeStam1

mg1_5m_virus_logistics_key1

mg1_5m_virus_logistics_correctness1

mg1_5m_virus_logistics_question2

mg1_5m_virus_logistics_answer2

mg1_5m_virus_logistics_answerTimeStam2

mg1_5m_virus_logistics_key2

mg1_5m_virus_logistics_correctness2

mg1_5m_virus_logistics_question3

mg1_5m_virus_logistics_answer3

mg1_5m_virus_logistics_answerTimeStam3

mg1_5m_virus_logistics_key3

mg1_5m_virus_logistics_correctness3

mg1_5m_virus_logistics_question4

mg1_5m_virus_logistics_answer4

mg1_5m_virus_logistics_answerTimeStam4

mg1_5m_virus_logistics_key4

mg1_5m_virus_logistics_correctness4

mg1_5m_virus_logistics_question5

mg1_5m_virus_logistics_answer5

mg1_5m_virus_logistics_answerTimeStam5

mg1_5m_virus_logistics_key5

mg1_5m_virus_logistics_correctness5

mg1_5m_virus_logistics_question6

mg1_5m_virus_logistics_answer6

mg1_5m_virus_logistics_answerTimeStam6

mg1_5m_virus_logistics_key6

mg1_5m_virus_logistics_correctness6

mg1_5m_virus_logistics_question7

mg1_5m_virus_logistics_answer7

mg1_5m_virus_logistics_answerTimeStam7

mg1_5m_virus_logistics_key7

mg1_5m_virus_logistics_correctness7

mg1_5m_virus_logistics_question8

mg1_5m_virus_logistics_answer8

mg1_5m_virus_logistics_answerTimeStam8

mg1_5m_virus_logistics_key8

mg1_5m_virus_logistics_correctness8

mg1_5m_virus_logistics_question9

mg1_5m_virus_logistics_answer9

mg1_5m_virus_logistics_answerTimeStam9

mg1_5m_virus_logistics_key9

mg1_5m_virus_logistics_correctness9

mg1_5m_virus_logistics_question10

mg1_5m_virus_logistics_answer10

mg1_5m_virus_logistics_answerTimeStamp 10

mg1_5m_virus_logistics_key10

mg1_5m_virus_logistics_correctness10

mg1_5m_virus_logistics_question11

mg1_5m_virus_logistics_answer11

mg1_5m_virus_logistics_answerTimeStamp 11

mg1_5m_virus_logistics_key11

mg1_5m_virus_logistics_correctness11

mg1_5m_virus_logistics_question12

mg1_5m_virus_logistics_answer12

mg1_5m_virus_logistics_answerTimeStamp 12

mg1_5m_virus_logistics_key12

mg1_5m_virus_logistics_correctness12

mg1_5m_virus_logistics_question13

mg1_5m_virus_logistics_answer13

mg1_5m_virus_logistics_answerTimeStamp 13

mg1_5m_virus_logistics_key13

mg1_5m_virus_logistics_correctness13

MINI-GAME 1, 6 MINUTES IN VIRUS & LOGISTICS QUESTIONS

Data for 6 minutes of progress into virus and logistics question. The number completed out of 13 possible questions.

mg1_6m_virus_logistics_timeStamp

mg1_6m_virus_logistics_question1

mg1_6m_virus_logistics_answer1

mg1_6m_virus_logistics_answerTimeStam1

mg1_6m_virus_logistics_key1

mg1_6m_virus_logistics_correctness1

mg1_6m_virus_logistics_question2

mg1_6m_virus_logistics_answer2

mg1_6m_virus_logistics_answerTimeStam2

mg1_6m_virus_logistics_key2

mg1_6m_virus_logistics_correctness2

mg1_6m_virus_logistics_question3

mg1_6m_virus_logistics_answer3

mg1_6m_virus_logistics_answerTimeStam3
mg1_6m_virus_logistics_key3
mg1_6m_virus_logistics_correctness3
mg1_6m_virus_logistics_question4
mg1_6m_virus_logistics_answer4
mg1_6m_virus_logistics_answerTimeStam4
mg1_6m_virus_logistics_key4
mg1_6m_virus_logistics_correctness4
mg1_6m_virus_logistics_question5
mg1_6m_virus_logistics_answer5
mg1_6m_virus_logistics_answerTimeStam5
mg1_6m_virus_logistics_key5
mg1_6m_virus_logistics_correctness5
mg1_6m_virus_logistics_question6
mg1_6m_virus_logistics_answer6
mg1_6m_virus_logistics_answerTimeStam6
mg1_6m_virus_logistics_key6
mg1_6m_virus_logistics_correctness6
mg1_6m_virus_logistics_question7
mg1_6m_virus_logistics_answer7
mg1_6m_virus_logistics_answerTimeStam7
mg1_6m_virus_logistics_key7
mg1_6m_virus_logistics_correctness7
mg1_6m_virus_logistics_question8
mg1_6m_virus_logistics_answer8
mg1_6m_virus_logistics_answerTimeStam8
mg1_6m_virus_logistics_key8
mg1_6m_virus_logistics_correctness8
mg1_6m_virus_logistics_question9
mg1_6m_virus_logistics_answer9
mg1_6m_virus_logistics_answerTimeStam9
mg1_6m_virus_logistics_key9
mg1_6m_virus_logistics_correctness9
mg1_6m_virus_logistics_question10
mg1_6m_virus_logistics_answer10
mg1_6m_virus_logistics_answerTimeStamp
10 mg1_6m_virus_logistics_key10
mg1_6m_virus_logistics_correctness10
mg1_6m_virus_logistics_question11
mg1_6m_virus_logistics_answer11
mg1_6m_virus_logistics_answerTimeStamp
11 mg1_6m_virus_logistics_key11
mg1_6m_virus_logistics_correctness11
mg1_6m_virus_logistics_question12
mg1_6m_virus_logistics_answer12
mg1_6m_virus_logistics_answerTimeStamp
12 mg1_6m_virus_logistics_key12
mg1_6m_virus_logistics_correctness12
mg1_6m_virus_logistics_question13
mg1_6m_virus_logistics_answer13
mg1_6m_virus_logistics_answerTimeStamp
13 mg1_6m_virus_logistics_key13
mg1_6m_virus_logistics_correctness13

MINI-GAME 1, 7 MINUTES IN VIRUS & LOGISTICS QUESTIONS

Data for 7 minutes of progress into virus and logistics question. The number completed out of 13 possible questions.

mg1_7m_virus_logistics_timeStamp

mg1_7m_virus_logistics_question1

mg1_7m_virus_logistics_answer1

mg1_7m_virus_logistics_answerTimeStamp 1

mg1_7m_virus_logistics_key1

mg1_7m_virus_logistics_correctness1

mg1_7m_virus_logistics_question2

mg1_7m_virus_logistics_answer2

mg1_7m_virus_logistics_answerTimeStamp 2

mg1_7m_virus_logistics_key2

mg1_7m_virus_logistics_correctness2

mg1_7m_virus_logistics_question3

mg1_7m_virus_logistics_answer3

mg1_7m_virus_logistics_answerTimeStamp 3

mg1_7m_virus_logistics_key3

mg1_7m_virus_logistics_correctness3

mg1_7m_virus_logistics_question4

mg1_7m_virus_logistics_answer4

mg1_7m_virus_logistics_answerTimeStamp 4

mg1_7m_virus_logistics_key4

mg1_7m_virus_logistics_correctness4

mg1_7m_virus_logistics_question5

mg1_7m_virus_logistics_answer5

mg1_7m_virus_logistics_answerTimeStamp 5

mg1_7m_virus_logistics_key5

mg1_7m_virus_logistics_correctness5

mg1_7m_virus_logistics_question6

mg1_7m_virus_logistics_answer6

mg1_7m_virus_logistics_answerTimeStamp 6

mg1_7m_virus_logistics_key6

mg1_7m_virus_logistics_correctness6

mg1_7m_virus_logistics_question7

mg1_7m_virus_logistics_answer7

mg1_7m_virus_logistics_answerTimeStamp 7 mg1_7m_virus_logistics_key7

mg1_7m_virus_logistics_correctness7

mg1_7m_virus_logistics_question8

mg1_7m_virus_logistics_answer8

mg1_7m_virus_logistics_answerTimeStamp 8

mg1_7m_virus_logistics_key8

mg1_7m_virus_logistics_correctness8

mg1_7m_virus_logistics_question9

mg1_7m_virus_logistics_answer9

mg1_7m_virus_logistics_answerTimeStamp 9

mg1_7m_virus_logistics_key9
mg1_7m_virus_logistics_correctness9
mg1_7m_virus_logistics_question10
mg1_7m_virus_logistics_answer10
mg1_7m_virus_logistics_answerTimeStamp 10
mg1_7m_virus_logistics_key10
mg1_7m_virus_logistics_correctness10
mg1_7m_virus_logistics_question11
mg1_7m_virus_logistics_answer11
mg1_7m_virus_logistics_answerTimeStamp 11
mg1_7m_virus_logistics_key11
mg1_7m_virus_logistics_correctness11
mg1_7m_virus_logistics_question12
mg1_7m_virus_logistics_answer12
mg1_7m_virus_logistics_answerTimeStamp 12
mg1_7m_virus_logistics_key12
mg1_7m_virus_logistics_correctness12
mg1_7m_virus_logistics_question13
mg1_7m_virus_logistics_answer13
mg1_7m_virus_logistics_answerTimeStamp 13
mg1_7m_virus_logistics_key13
mg1_7m_virus_logistics_correctness13

MINI-GAME 1, END OF VIRUS & LOGISTICS QUESTIONS

Data for each of the 13 questions upon completion.

mg1_end_virus_logistics_timeStamp
mg1_end_virus_logistics_question1
mg1_end_virus_logistics_answer1
mg1_end_virus_logistics_answerTimeStam p1 mg1_end_virus_logistics_key1
mg1_end_virus_logistics_correctness1
mg1_end_virus_logistics_question2
mg1_end_virus_logistics_answer2
mg1_end_virus_logistics_answerTimeStam p2 mg1_end_virus_logistics_key2
mg1_end_virus_logistics_correctness2
mg1_end_virus_logistics_question3
mg1_end_virus_logistics_answer3
mg1_end_virus_logistics_answerTimeStam p3 mg1_end_virus_logistics_key3
mg1_end_virus_logistics_correctness3
mg1_end_virus_logistics_question4
mg1_end_virus_logistics_answer4
mg1_end_virus_logistics_answerTimeStam p4 mg1_end_virus_logistics_key4
mg1_end_virus_logistics_correctness4

mg1_end_virus_logistics_question5
mg1_end_virus_logistics_answer5
mg1_end_virus_logistics_answerTimeStam
p5 mg1_end_virus_logistics_key5
mg1_end_virus_logistics_correctness5

mg1_end_virus_logistics_question6
mg1_end_virus_logistics_answer6
mg1_end_virus_logistics_answerTimeStam
p6 mg1_end_virus_logistics_key6
mg1_end_virus_logistics_correctness6

mg1_end_virus_logistics_question7
mg1_end_virus_logistics_answer7
mg1_end_virus_logistics_answerTimeStam
p7 mg1_end_virus_logistics_key7
mg1_end_virus_logistics_correctness7

mg1_end_virus_logistics_question8
mg1_end_virus_logistics_answer8
mg1_end_virus_logistics_answerTimeStam
p8 mg1_end_virus_logistics_key8
mg1_end_virus_logistics_correctness8

mg1_end_virus_logistics_question9
mg1_end_virus_logistics_answer9
mg1_end_virus_logistics_answerTimeStam
p9 mg1_end_virus_logistics_key9
mg1_end_virus_logistics_correctness9

mg1_end_virus_logistics_question10
mg1_end_virus_logistics_answer10
mg1_end_virus_logistics_answerTimeStam
p10 mg1_end_virus_logistics_key10
mg1_end_virus_logistics_correctness10

mg1_end_virus_logistics_question11
mg1_end_virus_logistics_answer11
mg1_end_virus_logistics_answerTimeStam
p11 mg1_end_virus_logistics_key11
mg1_end_virus_logistics_correctness11

mg1_end_virus_logistics_question12
mg1_end_virus_logistics_answer12
mg1_end_virus_logistics_answerTimeStam
p12 mg1_end_virus_logistics_key12
mg1_end_virus_logistics_correctness12

mg1_end_virus_logistics_question13
mg1_end_virus_logistics_answer13
mg1_end_virus_logistics_answerTimeStam
p13 mg1_end_virus_logistics_key13
mg1_end_virus_logistics_correctness13

MINI-GAME 1, ACTIVE LEARING QUESTIONS

Data for each of the 13 questions upon completion.

mg1_learning_timeStamp

mg1_learning_question1
mg1_learning_answer1
mg1_learning_answerTimeStamp1
mg1_learning_key1

mg1_learning_question2

mg1_learning_answer2

mg1_learning_answerTimeStamp2

mg1_learning_key2

mg1_learning_question3

mg1_learning_answer3

mg1_learning_answerTimeStamp3

mg1_learning_key3

mg1_learning_question4

mg1_learning_answer4

mg1_learning_answerTimeStamp4

mg1_learning_key4

mg1_learning_question5

mg1_learning_answer5

mg1_learning_answerTimeStamp5

mg1_learning_key5

mg1_learning_question6

mg1_learning_answer6

mg1_learning_answerTimeStamp6

mg1_learning_key6

mg1_learning_question7

mg1_learning_answer7

mg1_learning_answerTimeStamp7

mg1_learning_key7

mg1_learning_question8

mg1_learning_answer8

mg1_learning_answerTimeStamp8

mg1_learning_key8

MINI-GAME 2, 5 MINUTES IN

Data for 5 minutes of progress into minigame 2. The number completed out of 11 possible questions.

mg2_5m_timeStamp

mg2_5m_question1

mg2_5m_section1_answer1

mg2_5m_section1_answerTimeStamp1

mg2_5m_section1_key1

mg2_5m_section1_correctness1

mg2_5m_question2

mg2_5m_section1_answer2

mg2_5m_section1_answerTimeStamp2

mg2_5m_section1_key2

mg2_5m_section1_correctness2

mg2_5m_question3

mg2_5m_section1_answer3

mg2_5m_section1_answerTimeStamp3

mg2_5m_section1_key3

mg2_5m_section1_correctness3

mg2_5m_question4

mg2_5m_section1_answer4

mg2_5m_section1_answerTimeStamp4

mg2_5m_section1_key4
mg2_5m_section1_correctness4
mg2_5m_section2_answer4
mg2_5m_section2_answerTimeStamp4
mg2_5m_section2_key4
mg2_5m_section2_correctness4

mg2_5m_question5
mg2_5m_section1_answer5
mg2_5m_section1_answerTimeStamp5
mg2_5m_section1_key5
mg2_5m_section1_correctness5
mg2_5m_section2_answer5
mg2_5m_section2_answerTimeStamp5
mg2_5m_section2_key5
mg2_5m_section2_correctness5

mg2_5m_question6
mg2_5m_section1_answer6
mg2_5m_section1_answerTimeStamp6
mg2_5m_section1_key6
mg2_5m_section1_correctness6
mg2_5m_section2_answer6
mg2_5m_section2_answerTimeStamp6
mg2_5m_section2_key6
mg2_5m_section2_correctness6

mg2_5m_question7
mg2_5m_section1_answer7
mg2_5m_section1_answerTimeStamp7
mg2_5m_section1_key7
mg2_5m_section1_correctness7
mg2_5m_section2_answer7
mg2_5m_section2_answerTimeStamp7
mg2_5m_section2_key7
mg2_5m_section2_correctness7
mg2_5m_section3_answer7
mg2_5m_section3_answerTimeStamp7
mg2_5m_section3_key7
mg2_5m_section3_correctness7

mg2_5m_question8
mg2_5m_section1_answer8
mg2_5m_section1_answerTimeStamp8
mg2_5m_section1_key8
mg2_5m_section1_correctness8
mg2_5m_section2_answer8
mg2_5m_section2_answerTimeStamp8
mg2_5m_section2_key8
mg2_5m_section2_correctness8
mg2_5m_section3_answer8
mg2_5m_section3_answerTimeStamp8
mg2_5m_section3_key8
mg2_5m_section3_correctness8
mg2_5m_section4_answer8
mg2_5m_section4_answerTimeStamp8
mg2_5m_section4_key8
mg2_5m_section4_correctness8

mg2_5m_question9
mg2_5m_section1_answer9
mg2_5m_section1_answerTimeStamp9
mg2_5m_section1_key9
mg2_5m_section1_correctness9

mg2_5m_section2_answer9

mg2_5m_section2_answerTimeStamp9

mg2_5m_section2_key9

mg2_5m_section2_correctness9

mg2_5m_section3_answer9

mg2_5m_section3_answerTimeStamp9

mg2_5m_section3_key9

mg2_5m_section3_correctness9

mg2_5m_section4_answer9

mg2_5m_section4_answerTimeStamp9

mg2_5m_section4_key9

mg2_5m_section4_correctness9

mg2_5m_section5_answer9

mg2_5m_section5_answerTimeStamp9

mg2_5m_section5_key9

mg2_5m_section5_correctness9

mg2_5m_question10

mg2_5m_section1_answer10

mg2_5m_section1_answerTimeStamp10

mg2_5m_section1_key10

mg2_5m_section1_correctness10

mg2_5m_section2_answer10

mg2_5m_section2_answerTimeStamp10

mg2_5m_section2_key10

mg2_5m_section2_correctness10

mg2_5m_section3_answer10

mg2_5m_section3_answerTimeStamp10

mg2_5m_section3_key10

mg2_5m_section3_correctness10

mg2_5m_section4_answer10

mg2_5m_section4_answerTimeStamp10

mg2_5m_section4_key10

mg2_5m_section4_correctness10

mg2_5m_question11

mg2_5m_section1_answer11

mg2_5m_section1_answerTimeStamp11

mg2_5m_section1_key11

mg2_5m_section1_correctness11

mg2_5m_section2_answer11

mg2_5m_section2_answerTimeStamp11

mg2_5m_section2_key11

mg2_5m_section2_correctness11

mg2_5m_section3_answer11

mg2_5m_section3_answerTimeStamp11

mg2_5m_section3_key11

mg2_5m_section3_correctness11

mg2_5m_section4_answer11

mg2_5m_section4_answerTimeStamp11

mg2_5m_section4_key11

mg2_5m_section4_correctness11

MINIGAME 2, 6 MINUTES IN

Data for 6 minutes of progress into minigame 2. The number completed out of 11 possible questions.

mg2_6m_timeStamp

mg2_6m_question1

mg2_6m_section1_answer1

mg2_6m_section1_answerTimeStamp1

mg2_6m_section1_key1

mg2_6m_section1_correctness1

mg2_6m_question2

mg2_6m_section1_answer2

mg2_6m_section1_answerTimeStamp2

mg2_6m_section1_key2

mg2_6m_section1_correctness2

mg2_6m_question3

mg2_6m_section1_answer3

mg2_6m_section1_answerTimeStamp3

mg2_6m_section1_key3

mg2_6m_section1_correctness3

mg2_6m_question4

mg2_6m_section1_answer4

mg2_6m_section1_answerTimeStamp4

mg2_6m_section1_key4

mg2_6m_section1_correctness4

mg2_6m_section2_answer4

mg2_6m_section2_answerTimeStamp4

mg2_6m_section2_key4

mg2_6m_section2_correctness4

mg2_6m_question5

mg2_6m_section1_answer5

mg2_6m_section1_answerTimeStamp5

mg2_6m_section1_key5

mg2_6m_section1_correctness5

mg2_6m_section2_answer5

mg2_6m_section2_answerTimeStamp5

mg2_6m_section2_key5

mg2_6m_section2_correctness5

mg2_6m_question6

mg2_6m_section1_answer6

mg2_6m_section1_answerTimeStamp6

mg2_6m_section1_key6

mg2_6m_section1_correctness6

mg2_6m_section2_answer6

mg2_6m_section2_answerTimeStamp6

mg2_6m_section2_key6

mg2_6m_section2_correctness6

mg2_6m_question7

mg2_6m_section1_answer7

mg2_6m_section1_answerTimeStamp7

mg2_6m_section1_key7

mg2_6m_section1_correctness7

mg2_6m_section2_answer7

mg2_6m_section2_answerTimeStamp7

mg2_6m_section2_key7

mg2_6m_section2_correctness7

mg2_6m_section3_answer7

mg2_6m_section3_answerTimeStamp7

mg2_6m_section3_key7
mg2_6m_section3_correctness7

mg2_6m_question8
mg2_6m_section1_answer8
mg2_6m_section1_answerTimeStamp8
mg2_6m_section1_key8
mg2_6m_section1_correctness8
mg2_6m_section2_answer8
mg2_6m_section2_answerTimeStamp8
mg2_6m_section2_key8
mg2_6m_section2_correctness8
mg2_6m_section3_answer8
mg2_6m_section3_answerTimeStamp8
mg2_6m_section3_key8
mg2_6m_section3_correctness8
mg2_6m_section4_answer8
mg2_6m_section4_answerTimeStamp8
mg2_6m_section4_key8
mg2_6m_section4_correctness8

mg2_6m_question9
mg2_6m_section1_answer9
mg2_6m_section1_answerTimeStamp9
mg2_6m_section1_key9
mg2_6m_section1_correctness9
mg2_6m_section2_answer9
mg2_6m_section2_answerTimeStamp9
mg2_6m_section2_key9
mg2_6m_section2_correctness9
mg2_6m_section3_answer9
mg2_6m_section3_answerTimeStamp9
mg2_6m_section3_key9
mg2_6m_section3_correctness9
mg2_6m_section4_answer9
mg2_6m_section4_answerTimeStamp9
mg2_6m_section4_key9
mg2_6m_section4_correctness9
mg2_6m_section5_answer9
mg2_6m_section5_answerTimeStamp9
mg2_6m_section5_key9
mg2_6m_section5_correctness9

mg2_6m_question10
mg2_6m_section1_answer10
mg2_6m_section1_answerTimeStamp10
mg2_6m_section1_key10
mg2_6m_section1_correctness10
mg2_6m_section2_answer10
mg2_6m_section2_answerTimeStamp10
mg2_6m_section2_key10
mg2_6m_section2_correctness10
mg2_6m_section3_answer10
mg2_6m_section3_answerTimeStamp10
mg2_6m_section3_key10
mg2_6m_section3_correctness10
mg2_6m_section4_answer10
mg2_6m_section4_answerTimeStamp10
mg2_6m_section4_key10
mg2_6m_section4_correctness10

mg2_6m_question11
mg2_6m_section1_answer11
mg2_6m_section1_answerTimeStamp11

mg2_6m_section1_key11
mg2_6m_section1_correctness11
mg2_6m_section2_answer11
mg2_6m_section2_answerTimeStamp11
mg2_6m_section2_key11
mg2_6m_section2_correctness11
mg2_6m_section3_answer11
mg2_6m_section3_answerTimeStamp11
mg2_6m_section3_key11
mg2_6m_section3_correctness11
mg2_6m_section4_answer11
mg2_6m_section4_answerTimeStamp11
mg2_6m_section4_key11
mg2_6m_section4_correctness11

MINIGAME 2, 7 MINUTES IN

Data for 7 minutes of progress into minigame 2. The number completed out of 11 possible questions before time has runout.

mg2_7m_timeStamp
mg2_7m_question1
mg2_7m_section1_answer1
mg2_7m_section1_answerTimeStamp1
mg2_7m_section1_key1
mg2_7m_section1_correctness1
mg2_7m_question2
mg2_7m_section1_answer2
mg2_7m_section1_answerTimeStamp2
mg2_7m_section1_key2
mg2_7m_section1_correctness2
mg2_7m_question3
mg2_7m_section1_answer3
mg2_7m_section1_answerTimeStamp3
mg2_7m_section1_key3
mg2_7m_section1_correctness3
mg2_7m_question4
mg2_7m_section1_answer4
mg2_7m_section1_answerTimeStamp4
mg2_7m_section1_key4
mg2_7m_section1_correctness4
mg2_7m_section2_answer4
mg2_7m_section2_answerTimeStamp4
mg2_7m_section2_key4
mg2_7m_section2_correctness4
mg2_7m_question5
mg2_7m_section1_answer5
mg2_7m_section1_answerTimeStamp5
mg2_7m_section1_key5
mg2_7m_section1_correctness5
mg2_7m_section2_answer5
mg2_7m_section2_answerTimeStamp5
mg2_7m_section2_key5
mg2_7m_section2_correctness5
mg2_7m_question6
mg2_7m_section1_answer6
mg2_7m_section1_answerTimeStamp6

mg2_7m_section1_key6
mg2_7m_section1_correctness6
mg2_7m_section2_answer6
mg2_7m_section2_answerTimeStamp6
mg2_7m_section2_key6
mg2_7m_section2_correctness6

mg2_7m_question7
mg2_7m_section1_answer7
mg2_7m_section1_answerTimeStamp7
mg2_7m_section1_key7
mg2_7m_section1_correctness7
mg2_7m_section2_answer7
mg2_7m_section2_answerTimeStamp7
mg2_7m_section2_key7
mg2_7m_section2_correctness7
mg2_7m_section3_answer7
mg2_7m_section3_answerTimeStamp7
mg2_7m_section3_key7
mg2_7m_section3_correctness7

mg2_7m_question8
mg2_7m_section1_answer8
mg2_7m_section1_answerTimeStamp8
mg2_7m_section1_key8
mg2_7m_section1_correctness8
mg2_7m_section2_answer8
mg2_7m_section2_answerTimeStamp8
mg2_7m_section2_key8
mg2_7m_section2_correctness8
mg2_7m_section3_answer8
mg2_7m_section3_answerTimeStamp8
mg2_7m_section3_key8
mg2_7m_section3_correctness8
mg2_7m_section4_answer8
mg2_7m_section4_answerTimeStamp8
mg2_7m_section4_key8
mg2_7m_section4_correctness8

mg2_7m_question9
mg2_7m_section1_answer9
mg2_7m_section1_answerTimeStamp9
mg2_7m_section1_key9
mg2_7m_section1_correctness9
mg2_7m_section2_answer9
mg2_7m_section2_answerTimeStamp9
mg2_7m_section2_key9
mg2_7m_section2_correctness9
mg2_7m_section3_answer9
mg2_7m_section3_answerTimeStamp9
mg2_7m_section3_key9
mg2_7m_section3_correctness9
mg2_7m_section4_answer9
mg2_7m_section4_answerTimeStamp9
mg2_7m_section4_key9
mg2_7m_section4_correctness9
mg2_7m_section5_answer9
mg2_7m_section5_answerTimeStamp9
mg2_7m_section5_key9
mg2_7m_section5_correctness9

mg2_7m_question10
mg2_7m_section1_answer10
mg2_7m_section1_answerTimeStamp10

mg2_7m_section1_key10
mg2_7m_section1_correctness10
mg2_7m_section2_answer10
mg2_7m_section2_answerTimeStamp10
mg2_7m_section2_key10
mg2_7m_section2_correctness10
mg2_7m_section3_answer10
mg2_7m_section3_answerTimeStamp10
mg2_7m_section3_key10
mg2_7m_section3_correctness10
mg2_7m_section4_answer10
mg2_7m_section4_answerTimeStamp10
mg2_7m_section4_key10
mg2_7m_section4_correctness10
mg2_7m_question11
mg2_7m_section1_answer11
mg2_7m_section1_answerTimeStamp11
mg2_7m_section1_key11
mg2_7m_section1_correctness11
mg2_7m_section2_answer11
mg2_7m_section2_answerTimeStamp11
mg2_7m_section2_key11
mg2_7m_section2_correctness11
mg2_7m_section3_answer11
mg2_7m_section3_answerTimeStamp11
mg2_7m_section3_key11
mg2_7m_section3_correctness11
mg2_7m_section4_answer11
mg2_7m_section4_answerTimeStamp11
mg2_7m_section4_key11
mg2_7m_section4_correctness11

SITUATIONAL AWARENESS QUESTIONS, PHASE 2

Data for the 3 situational awareness questions that are collected toward the end of Phase 2.

sa_p2_question1
sa_p2_answer1
sa_p2_key1
sa_p2_correctness1
sa_p2_question2
sa_p2_answer2
sa_p2_key2
sa_p2_correctness2
sa_p2_question3
sa_p2_answer3
sa_p2_key3
sa_p2_correctness3
sa_p2_question4

sa_p2_answer4

sa_p2_key4

sa_p2_correctness4

sa_p2_question5

sa_p2_answer5

sa_p2_key5

sa_p2_correctness5

sa_p2_question6

sa_p2_answer6

sa_p2_key6

sa_p2_correctness6

SITUATIONAL AWARENESS QUESTIONS, PHASE 3

Data for the 3 situational awareness questions that are collected toward the end of Phase 3.

sa_p3_question1

sa_p3_answer1

sa_p3_key1

sa_p3_correctness1

sa_p3_question2

sa_p3_answer2

sa_p3_key2

sa_p3_correctness2

sa_p3_question3

sa_p3_answer3

sa_p3_key3

sa_p3_correctness3

sa_p3_question4

sa_p3_answer4

sa_p3_key4

sa_p3_correctness4

sa_p3_question5

sa_p3_answer5

sa_p3_key5

sa_p3_correctness5

sa_p3_question6

sa_p3_answer6

sa_p3_key6

sa_p3_correctness6

sa_helpClicked

sa_timeStamp

USABILITY QUESTIONS

Data for the 18 usability questions that are collected at the very end of the game.

u_question1

u_answer1

u_question2

u_answer2

u_question3

u_answer3

u_question4

u_answer4

u_question5

u_answer5

u_question6

u_answer6

u_question7

u_answer7

u_question8

u_answer8

u_question9

u_answer9

u_question10

u_answer10

u_question11

u_answer11

u_question12

u_answer12

u_question13

u_answer13

u_question14

u_answer14

u_question15

u_answer15

u_question16

u_answer16

u_question17

u_answer17

u_question18

u_answer18

u_timeStamp

APPENDIX G - Usability Items

Please answer each of the following questions by checking the box that best represents your opinion.

1. I think I would like to play the Virus Slayer game frequently

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

2. I found the Virus Slayer game unnecessarily complex.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

3. I thought the Virus Slayer game was easy to use.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

4. I think I would need the support of a technical person to be able to play Virus Slayer.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

5. I found the various functions in Virus Slayer to be well integrated.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

6. I thought there was too much inconsistency in Virus Slayer.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

7. I would imagine most people would learn to use Virus Slayer very quickly.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

8. I found Virus Slayer very cumbersome to use.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

9. I felt very confident using Virus Slayer.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

10. I needed to learn a lot of things before I could get going with Virus Slayer.

Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree

11. Overall, I would rate the user friendliness of Virus Slayer as:

☐ Worst Imaginable	☐ Awful	☐ Poor	☐ OK	☐ Good	☐ Excellent	☐ Best Imaginable