Project proposal

Team name : Team 19, Mickael Zeitoun, Yeal Berkovich and Nitzan Ofer

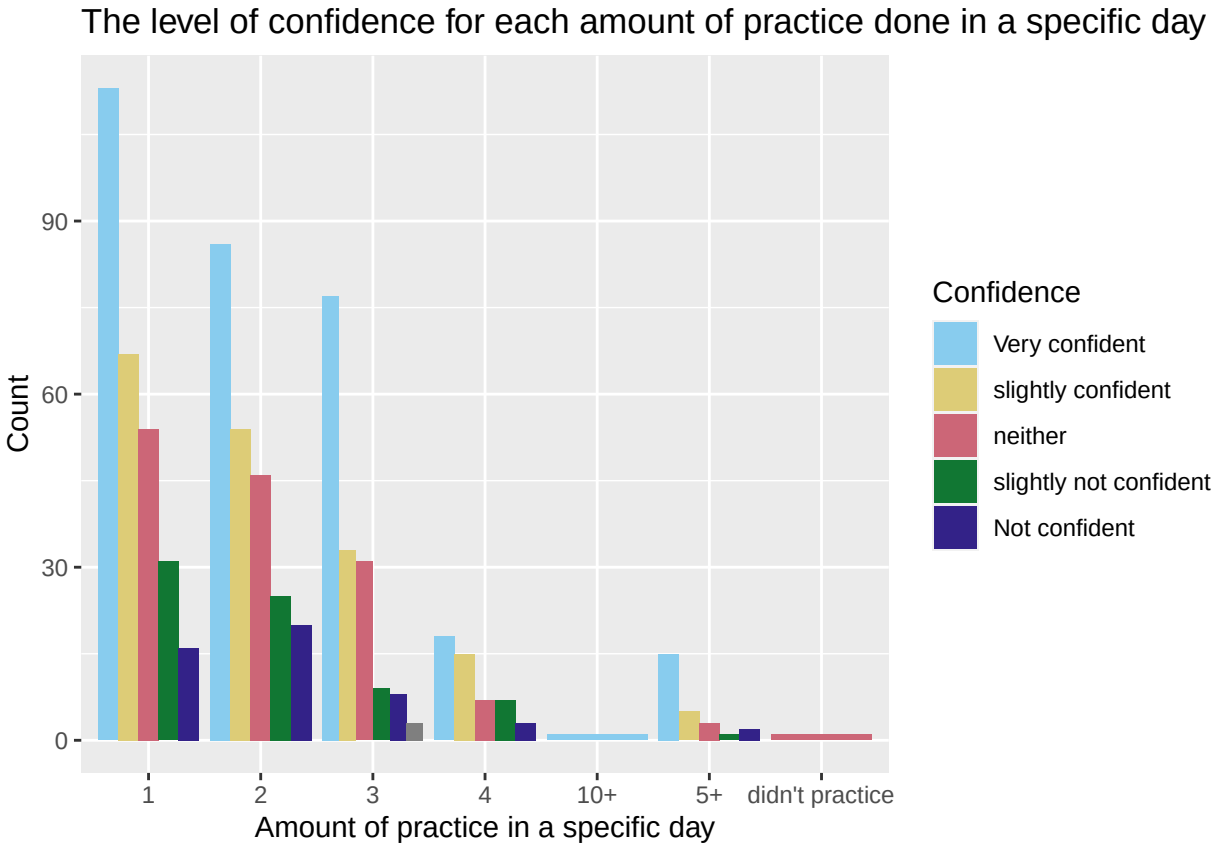
1. Introduction

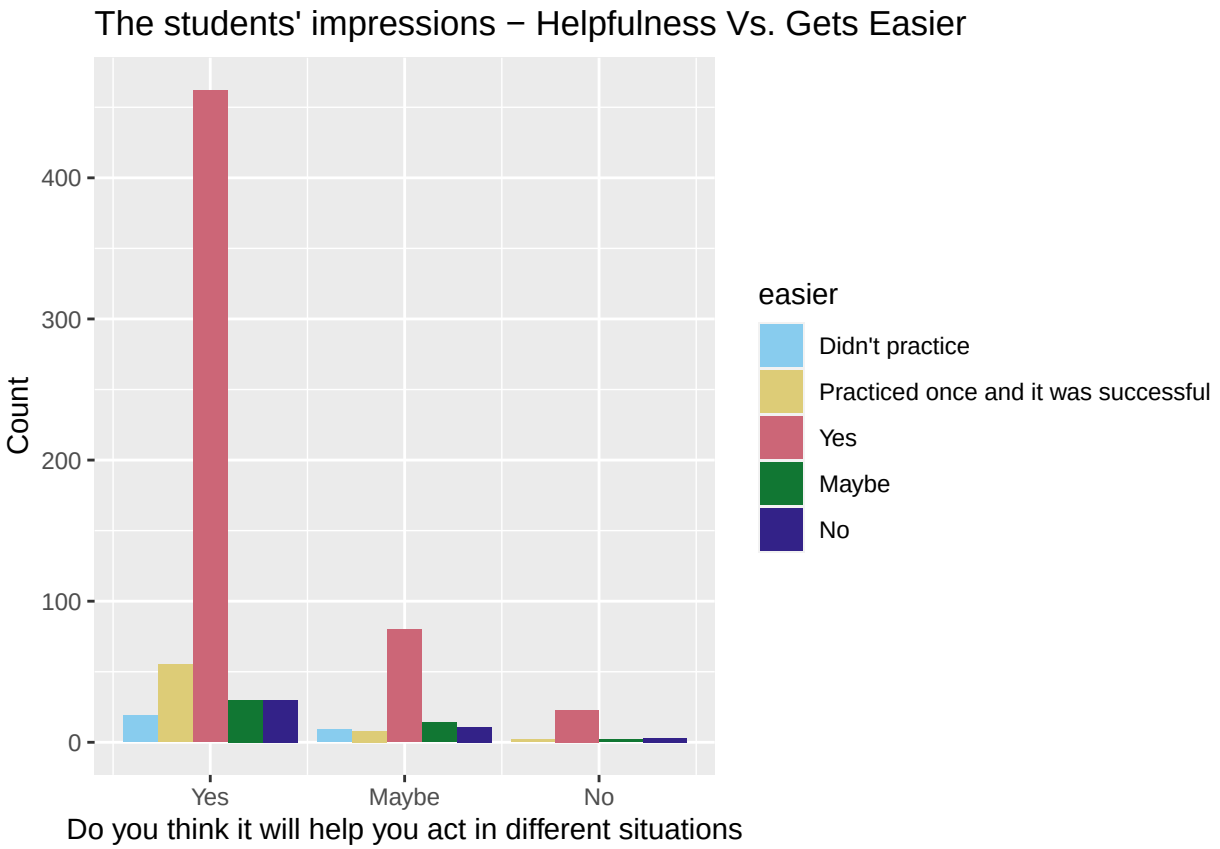
In this study, 748 recruits with the intent of volunteering in Magen David Adom (MDA) from all over Israel attended a training camp that took place in the summer of 2022, and in this specific training camp the volunteers were given VR glasses as part of their training. The training camps purpose was to give the volunteers the tools, knowledge and confidence to volunteer in ambulances that will answer to emergency medical calls. During the training camp, the volunteers answered a survey consisting of subjective questions on various scenarios related to emergency medicine. Our general data science question is "is there a correlation between the volunteers performance in the simulation of various medical scenarios in VR glasses and their confidence level". The general problem area that this analysis contributes to is the readiness and professionalism of the emergency medicine forces. We find this matter important because with higher readiness and professionalism resulting from additional practice using the VR simulators, more lives can be saved when answering to emergency medical calls. This hasn't been done before because the VR technology is a relatively new and growing field, and only in the summer of 2022 volunteers were given the chance to use the VR simulators. This matter poses difficulties such as scarcity of such data that can hinder conducting extensive studies on this specific correlation. Another difficulty is subjectivity of confidence feelings, volunteers' confidence feelings is inherently subjective. Each individual may interpret and express their confidence differently, making it difficult to establish a standardized and objective measure. Subjective self-assessment can be influenced by various factors such as personal biases, previous experiences, and emotional states. Our approach involves analyzing the grades given to volunteers the used the VR sets, and checking the correlation between the grades given and the confidence of the volunteers.

2. Data

This study involves conducting a survey with 748 teenagers from all parts of Israel, over a few days. The survey consists of subjective questions on various scenarios related to emergency medicine and was conducted at a summer camp where MDA volunteers from across the country were present. The data collected includes multiple sections. -Questions about a vein opening scenario -Questions about monitor scenario -Questions about plasma scenario -Questions about a scenario in which a motorcyclist's leg was amputated and how they reacted to the issue. -Questions about their relationship with the mobile intensive care unit -The volunteers critics about the usefulness of the simulator system (VR) -The level of challenge they felt, and the friendliness of the simulator. -Does practice helped them improve we will be interested in the different scenarios they were tested on as explanatory variables. We'll try to find a correlation between these sections and "The volunteers critics about the usefulness of the simulator system (VR)" section. This would help us understand better if practicing the different scenarios gave them more confidence about their ability to perform.

3. Preliminary results


The level of confidence for each amount of practice done in a specific day
Count
90
60
30
0
1
2
3
4
10+
5+
didn't practice
Amount of practice in a specific day
Confidence
Very confident
slightly confident
neither
slightly not confident
Not confident



4. Data analysis plan

our plan is to use the predictors: 1. Which of the following is the order of operations to obtain venous access (opening an IV vein) ? 2. The tests you performed in the scenario on the monitor of Magen David Adom's ambulance. 3. What equipment is required for preparing a plasma kit (in case you performed the plasma scenario)? 4. From what did the trauma patient suffer? 5. What were the signs and symptoms that helped you diagnose the injured person? 6. What are the signs and symptoms that helped you decide if the treatment was successful 7. In the equipment that descends to the case (Batan) where is the equipment needed to treat the amputation (if you performed the trauma scenario)? 8. What immediate treatment should be performed on the injured person after applying a tourniquet?

We would like to find the correlation between the predictors above and a weighted grade of the columns: 1. Do you think the simulator presents a realistic situation? 2. Do you think the simulator can improve your ability to handle similar events? 3. Do you think the simulator helps you understand the work at NTNs? 4. Did you encounter any difficulties while playing the simulator?

The methods we would like to use in order to explore our research question include: Correlation analysis - by assessing the correlation coefficient (e.g., Pearson's correlation) between the simulation grades (X) and confidence feelings (Y) to determine the strength and direction of the relationship. In addition, calculating means, standard deviations, and other descriptive measures to summarize the distribution of simulation grades and confidence feelings.

We will work together and split the workload equally according to the following schedule: Week 1: Data cleaning and altering. Week 2: Data analysis Week 3: Drawing conclusions and possible improvements

Appendix

Data README

SISE2601 Project data description

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This Markdown file describes the data folder structure and organization …

Questions about a vein opening scenario

- Which of the following is the order of operations to obtain venous access (opening an IV vein) ? Possible answers : Opening a vein - 0 - Did not perform the scenario, not relevant - "I did not perform the scenario" 1 - Correct answer - "Placing a vein blockage, disinfection with a sponge, inserting a venipuncture needle, removing the vein blockage, performing a 'flush' with saline, securing." 2 - Incorrect answer - "Placing a vein blockage, disinfection with a sponge, inserting a venipuncture needle, securing, removing the vein blockage, performing a 'flush' with saline" or "Disinfection with a sponge, placing a vein blockage, inserting a venipuncture needle, removing the vein blockage, performing a 'flush' with saline, securing" or "Not familiar with the sequence of actions."

Questions about monitor scenario

- The tests you performed in the scenario on the monitor of Magen David Adom's ambulance. Possible answers : Familiarity with the monitor - 0 - Did not perform the scenario, irrelevant answer - "I did not perform the scenario." 1 - Correct answer - "Blood pressure, oxygen saturation, monitor, ECG, capnometry." 2 - Partial answer (3 out of 5) - "Blood pressure, oxygen saturation, monitor." 3 - Partial answer (4 out of 5) - "Blood pressure, oxygen saturation, ECG, monitor." 4 - Incorrect answer - "Blood pressure, auscultation, oxygen saturation, ECG, monitor, capnometry" or "Blood pressure, troponin, oxygen saturation, ECG, monitor."

Questions about plasma scenario

- What equipment is required for preparing a plasma kit (in case you performed the plasma scenario)? Pssible answers: Preparing plasma 0 - Did not perform the scenario, not relevant - "50 cc syringe." 1 - Correct answer - "Special set, 200 cc sterile water for injection, regular infusion set, plasma AB bottle." Incorrect answer 2 - "Special set, 200 cc sterile water for injection, 10 cc syringe, regular infusion set, plasma AB bottle" or "Special set, 200 cc saline solution, regular infusion set, plasma O bottle" or "Special set, plasma AB bottle" or "Plasma AB bottle."

Questions about a scenario in which a motorcyclist's leg was amputated and how they reacted to the issue.

- From what did the trauma patient suffer? Answers: The trauma scenario of a motorcycle rider (Mega Code) involves an injured person with a complete leg amputation (and application of a tourniquet), chest seal under pressure.

Columns K to O - 0 - Not performed, not relevant - "0." 1 - Correct answer - "Amputation + chest injury." 2 - Incorrect answer - "Amputation + head injury" or "Amputation + abdominal injury" or "Amputation + limb injuries."

- What were the signs and symptoms that helped you diagnose the injured person? Answers: Maximum score - 4. Correct answer +1 - "Diminished breath sounds on one side," "Signs of chest injury," "Carotid pulse," "Non-palpable radial pulse." Unnecessary answer -1 - "Level of consciousness (full consciousness)," "Level of consciousness (lack of consciousness)." Incorrect answer -2 - "Signs of head injury," "Signs of abdominal injury," "Non-palpable carotid pulse."
- What immediate treatment should be performed on the injured person after applying a tourniquet? Answers: 0 - Did not execute the scenario - No answer. 1 - Correct answer - "insertion of a needle for chest drainage". 2 - Incorrect answer - "fixation to back board" or "intubation" or "oxygen administration" or "head fixation"
- What are the signs and symptoms that helped you decide if the treatment was successful

Answers: Maximum Score 3. Correct answer +1 - "Full level of consciousness" or "radial breathing" or "Good air intake equals listening on both sides". Incorrect answer -2 - "equal pupils" or "radial not melted" or "-2". Unnecessary answer -1 - "Carotidi Mannerism".

- In the equipment that descends to the case (Batan) where is the equipment needed to treat the amputation (if you performed the trauma scenario) Answers:

0 - I don't know - "I don't know". 1 - Correct answer - "In an ambu bag in the left front compartment". 2 - Incorrect answer - "in an ambu bag in the upper compartment" or "in an ambu bag in the right front compartment" or "in a medicine bag in the center compartment" or "in an upper shelf medicine bag"

Questions about their relationship with the mobile intensive care unit

- How comfortable do you feel volunteering at Natan (even if you haven't done any relevant training)? Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- To what extent do you know how to use the monitor Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- How familiar you are with the equipment at Natan? Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- How significant you feel during your Bentan shift (if you are not licensed in NTN, treat the question as theoretical) Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- To what extent do you feel that you understand the order of operations in the treatment of NTN Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score

The volunteers critics about the usefulness of the simulator system (VR)

- Do you think the simulator presents a realistic situation? Answers: 1 - "Yes". 2 - "There is a lack of dialogue with the patient." 3 - "Maybe". 4 - "No". 5-"I Didn't"

- Do you think the simulator can improve your ability to handle similar events? Answers: 1 - “Yes”. 2 - “Maybe”. 3 - “No”
- Do you think the simulator helps you understand the work at NTNs? Answers: 1 - “Yes”. 2 - “Maybe”. 3 - “No”. 4- “I Didn’t”
- Did you encounter any difficulties while playing the simulator? Answers: 1 - “Yes”. 2 - “Maybe”. 3 - “No”

The level of challenge they felt, and the friendliness of the simulator.

- How challenging was the activity from a mental standpoint? (thinking, concentration, responsibility, etc.) Answers: On a scale of 5 with -1 being the low score, and 5 being the high score (1=the activity was not challenging)
- How physically challenging was the activity? Answers: On a scale of 5 with -1 being the low score, and 5 being the high score (1=the activity was not challenging)
- How stressful was the pace of the task? How much time pressure did you feel? Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- How successful do you think you are in performing the tasks you need to perform? Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- What was the level of effort required of you to reach your level of performance? Answers: On a scale of 5 with -1 being the lowest score, and 5 being the high score
- How insecure, discouraged, irritated and stressed did you feel during this activity? Answers: On a scale of 5 where 1 is the low score (to a low degree), and 5 is the high score (to a high degree)
- Did you encounter any difficulties while playing the simulator? 1 - “Yes”. 2 - “Maybe”. 3 - “No”
- I think MDA’s new simulator… Answers: 1 - “Not effective, and I didn’t see any added value in it.” 2 - “Assists in learning the process, but cannot serve as an addition to practical practices.” 3 - “Used as a good preparation before practical practices.” 4 - “is a good addition in parallel with practical practices”

Does practice helped them improve

- How many practices did a volunteer did today?
- Does the game become easier to use after a few practices or during practice? Answer:

0 - This is a player’s first practice, so does not represent a relevant impression of the question - “I didn’t practice”. 1 - The experience was very successful, from the first practice feeling comfortable with the simulator - “I played once and it’s perfect”. 2 - “Yes”. 3 - “Maybe”. 4 - “No”.

- Weighted grade from columns K to O - practicing trauma scenario of motorcyclist (mega code) to injured with complete leg amputation (and H.A. laying), pressurized air chest - N/A - not performed, irrelevant; “1” low score; “5” High score
- Did not do the scenario Answers: True or False

Source code

```
library(knitr)
library(tidyverse)
library(broom)
library(htmltools)
library(readxl)
opts_chunk$set(echo=FALSE) # hide source code in the document


vr_data <- read_excel('C:\\Users\\Nitza\\Desktop\\adv programming\\proposal template\\data\\MDA ALS VR

colnames(vr_data)[25] <- "nonconfident"
colnames(vr_data)[30] <- "amountOfPractice"

vr_data1 <- vr_data %>%
  mutate( `amountOfPractice` = replace_na(`amountOfPractice`, "3") )

ggplot(vr_data1,aes(x = amountOfPractice, fill = factor(nonconfident))) +
  geom_bar(position = position_dodge(), na.rm = TRUE) +
  labs(x = "Amount of practice in a specific day",
       y = "Count",
       title = "The level of confidence for each amount of practice done in a specific day",
       fill = "Confidence") +
  scale_x_discrete(labels = c("1", "2", "3", "4", "10+", "5+", "didn't practice")) +
  scale_fill_manual(values = c("1" = "#88CCEE",
                               "2" = "#DDCC77", "3" = "#CC6677",
                               "4" = "#117733", "5" = "#332288"),
                    labels = c("Very confident", "slightly confident",
                               "neither", "slightly not confident",
                               "Not confident"))
colnames(vr_data)[18] <- "helpful"
colnames(vr_data)[32] <- "easier"

ggplot(vr_data, aes(x = helpful, fill = factor(easier))) +
  geom_bar(na.rm = TRUE, position = position_dodge()) +
  labs(x="Do you think it will help you act in different situations",
       y="Count",
       title = "The students' impressions - Helpfulness Vs. Gets Easier",
       fill = "easier") +
  scale_x_continuous(breaks = c(1, 2, 3), labels = c("Yes", "Maybe", "No")) +
  scale_fill_manual(values = c("0" = "#88CCEE", "1" = "#DDCC77", "2" = "#CC6677",
                               "3" = "#117733",
                               "4" = "#332288"),
                    labels = c("Didn't practice", "Practiced once and it was successful",
                               "Yes", "Maybe", "No"))
cat(readLines('C:\\Users\\Nitza\\Desktop\\adv programming\\proposal template\\data\\README.md'), sep =
```