An Implementation of a Training System on How to Use the Positive and Negative Symptom Scale Instrument

Presented to Dr. Scott McLeod

Registrar of the College of Physicians & Surgeons of Alberta

Organized by Jana Osea, Ayushi Vig, and Safaa Khalil

February 28, 2021

Table of Contents

Summary

The Positive and Negative Syndrome Scale (PANSS) is a well-known instrument that has been used in psychology to assess symptoms presented in schizophrenic patients. PANSS identifies 30 symptoms: (7) negative symptoms, (7) positive symptoms and (16) generic symptoms. Each symptom is rated based on the degree of psychosis experienced from 1 to 7; 1 being the lowest level of psychosis experienced and 7 being the highest. The PANSS instrument is also available in several languages such as English, French, and Italian. In this experiment, we will only work with the three mentioned languages. The goal of the PANSS instrument is to implement a rating experiment that can be used for training future physicians on assessing schizophrenic patients' symptoms and their intent for suicide.

We have been asked by the College of Physicians & Surgeons of Alberta to develop and implement an efficient analysis system that will aid physicians in training on how to use the Positive and Negative Syndrome Scale (PANSS) instrument. The motivation of this experiment is to provide immediate feedback on each student's performance with PANSS to highlight areas of improvement. Successful implantation of PANSS provides better healthcare treatment to patients suffering from schizophrenia.

Using the programming language R, we have created an app that will use the mentioned PANSS instrument for training purposes. To download the app, use the following website:

https://github.com/jfosea/panss.

This website is accessible to everyone and contains the required analysis system. Physicians will watch a 30-minute video of a patient and then use the app to assess the patient's psychotic symptoms. Details on how to download and run the app can be found in the data analysis section of this report.

After downloading and running the given app in R, a window containing the PANSS questionnaire will appear and each student will be prompted to indicate their identification code and the language they wish to take the test in. Note that the assessment will only be in English, French, and Italian. The PANSS assessment will contain thirty questions with seven answers to choose from for each question. All questions must be answered to submit the test. At the end of the assessment, a passing or failing score will be given to each participant indicating their performance with the PANSS instrument.

Introduction

The Positive and Negative Syndrome Scale (PANSS) instrument was created to provide advanced medical care to schizophrenic patients. The PANSS instrument is an effective tool used by physicians for rating the positive and negative symptoms experienced by schizophrenic patients, concentrating on their level of psychosis and intention of suicide. In this report, we will introduce an effective analysis system to be used by physicians in training as requested by the College of Physicians & Surgeons of Alberta. Our goal is to develop an effective system and demonstrate its usage, while providing constructive feedback to participants.

Purpose of the Experiment

Providing Physicians with instant feedback on their performance is crucial to providing patients with better healthcare treatment. To find the best treatment, a Physician must be able to assess the patient's symptoms and formulate a treatment plan. This requires proper training and supervised preparation. The Positive and Negative Syndrome Scale (PANSS) is a common instrument used in healthcare for training and practical purposes. PANSS is used to assess and rate psychological symptoms associated with schizophrenic patients in order to find an effective treatment plan. The successful use of this instrument may provide relief to patients suffering from schizophrenia.

The purpose of this experiment is to generate a practical data analysis system to be used by doctors in training at the College of Physicians & Surgeons of Alberta. This system aims to teach Physicians how to properly use the PANSS instrument to treat patients with schizophrenia. Our motivation is to develop such a system that will ease the training process for future physicians and provide instant feedback on their performance.

Sources and Methods

This report consisted of the following elements:

- Proper data assessment techniques
- Data obtained from a PANSS instrument workshop
- Online articles

Data Collection Protocol

A total of 72 physicians from the international community participated in the workshop. The data collected from these 72 physicians was provided and was treated as a training dataset to develop the analysis model.

First, the physicians were acquainted with the PANSS instrument and the 30 different psychological symptoms, comprising 7 positive symptoms, 7 negative symptoms, and 16 generic (neutral) symptoms (as mentioned in Table 1). As a part of the workshop, every physician had to watch a 30-minute video of a patient and use the PANSS instrument to assess the patient's psychotic symptoms. Additionally, the PANSS instrument was available in three languages, being English, French, and Italian.

After watching the video, the physicians had to rate the degree of psychosis exhibited by the patient for each symptom on a scale of 1 (low) to 7 (high). An app was also developed following the above data collection protocol to collect the data from any future set of physicians attending the workshop. The code for the app and the manual to set it up was made available to the organizers. The code can be found at https://github.com/jfosea/panss.

All the data collected from the physicians was kept confidential and only the developers of the app had admin access to edit/rewrite any information.

The rating collected from each participating physician was then compared to an "Expert's" rating "key" to determine the result of the training. The criterion used to determine the pass/fail result was that at least 5 out of 7 ratings for both the positive and negative symptoms were within 1 of the Expert's ratings and at least 10 out 16 ratings for generic symptoms were within 1 of the Expert's ratings for the same.

The workshop ended with a presentation of the Pass/Fail results of the physicians. (Chen, 2021)

Table 1: The PANSS instrument identifies thirty symptoms associated with schizophrenia and labels them accordingly.

Table 1. PANSS Variable Definitions

Variable	Definition
RATER	Rater's identification code
	RATER = 0 is the Expert Rater
LANG	Languages used
	E = English, F = French, I = Italian
P1	Delusions
P2	Conceptual disorganization
P3	Hallucinatory behavior
P4	Excitement
P5	Grandiosity
P6	Suspiciousness/Persecution
P7	Hostility
N1	Blunted affect
N2	Emotional withdrawal
N3	Poor rapport
N4	Passive/Apathetic social withdrawal
N5	Difficulty in abstract thinking
N6	Lack of spontaneity
N7	Stereotyped thinking
G1	Somatic concern
G2	Anxiety
G3	Guilt feeling
G4	Tension
G5	Mannerisms and posturing
G6	Depression
G7	Motor retardation
G8	Uncooperativeness
G9	Unusual thought content
G10	Disorientation
G11	Poor attention
G12	Lack of judgment and insight
G13	Disturbance of volition
G14	Poor impulse control
G15	Preoccupation
G16	Active social avoidance

Data Analysis System

Train Me Page

The "Train Me Page" is a questionnaire that each physician attending the workshop needs to fill. To ensure no errors and duplicates in the dataset, some error checks were built into the app.

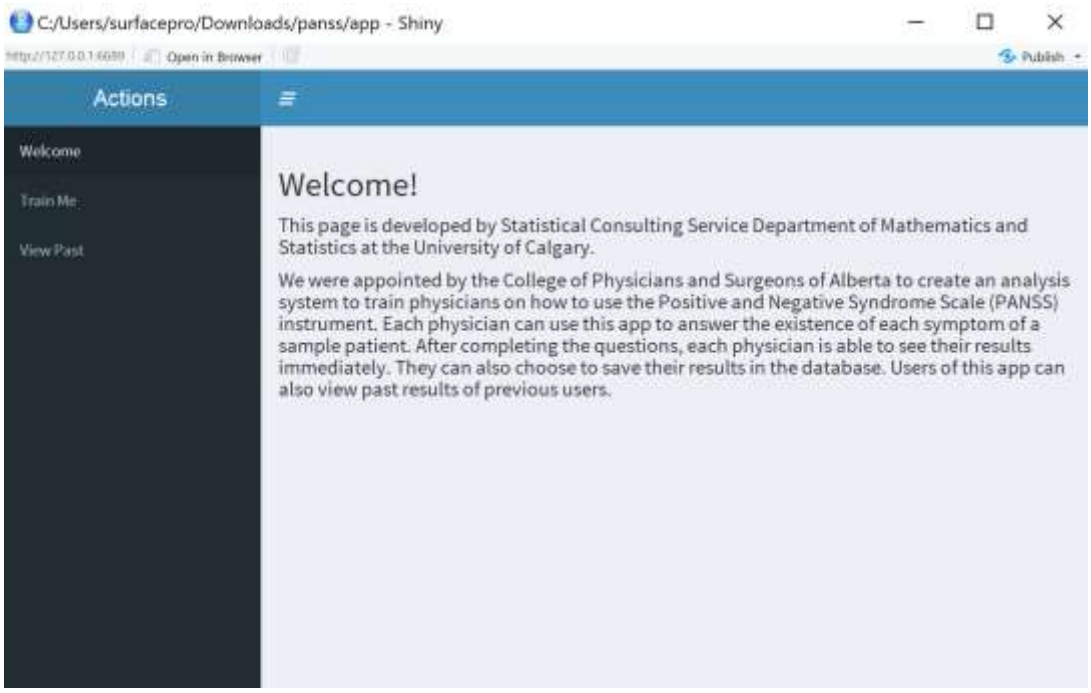
Only Integers would be accepted for the Rater ID and hence, an error will show if strings or decimal numbers were entered. Also, to ensure that all the IDs are unique, no number between and including 0 and 72 would be accepted (since this range has already been used for the setup of the app). An error will also show if there is no entry for the Rater ID.

To ensure no ambiguous data is collected, the physicians were provided with options to choose for the language and the rating for each of the symptoms.

Once the questionnaire is submitted, the pass/fail result is displayed along with the number of correct answers for each of the positive, negative, and general symptoms. The physician also gets the opportunity to save their response and to check if the values they have entered are correct. The correct rating range for each incorrectly rated symptom is displayed beneath each symptom.

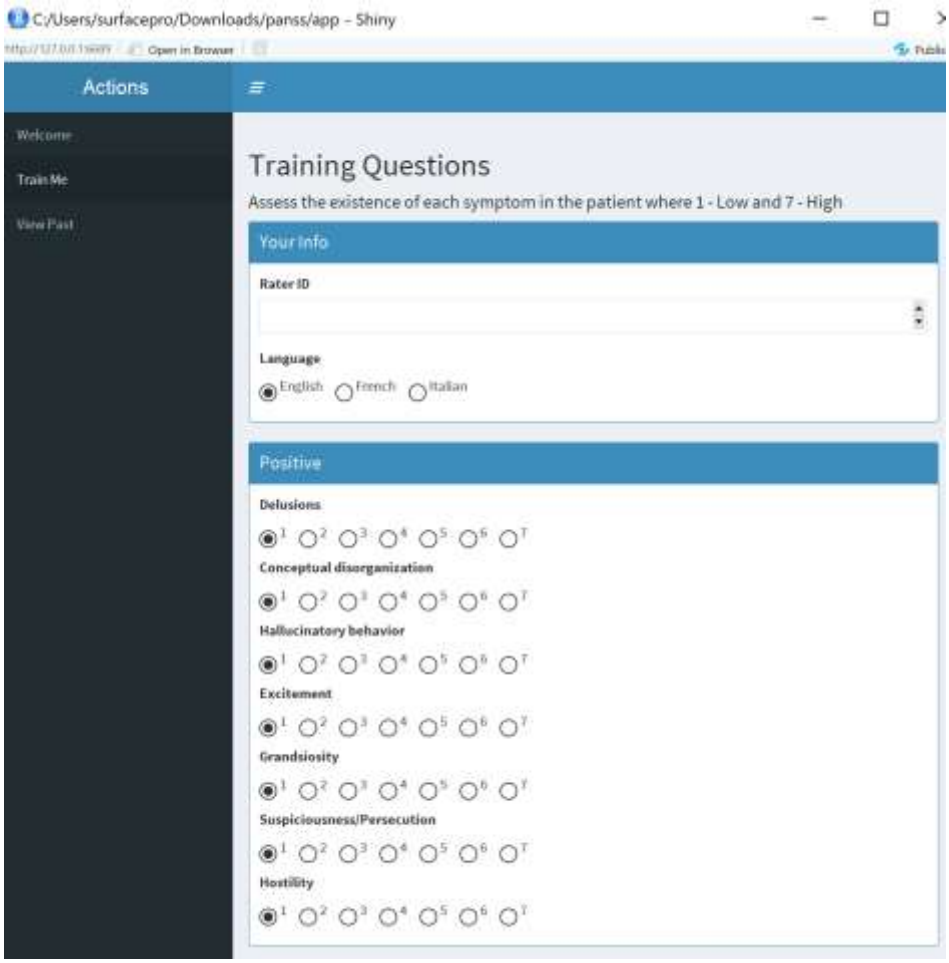
The figure below shows the Welcome Page when you first run the app. It has a short description of its purpose.

Figure 1. Welcome Page



The figure below is a snapshot of the main training page of the app. Each user must put a unique rater id. As well, the user must indicate the language. The rest of the questions are indicated below and cannot be left unanswered. A default answer of 1 is placed to ensure a non-empty response.

Figure 2. Training Questions

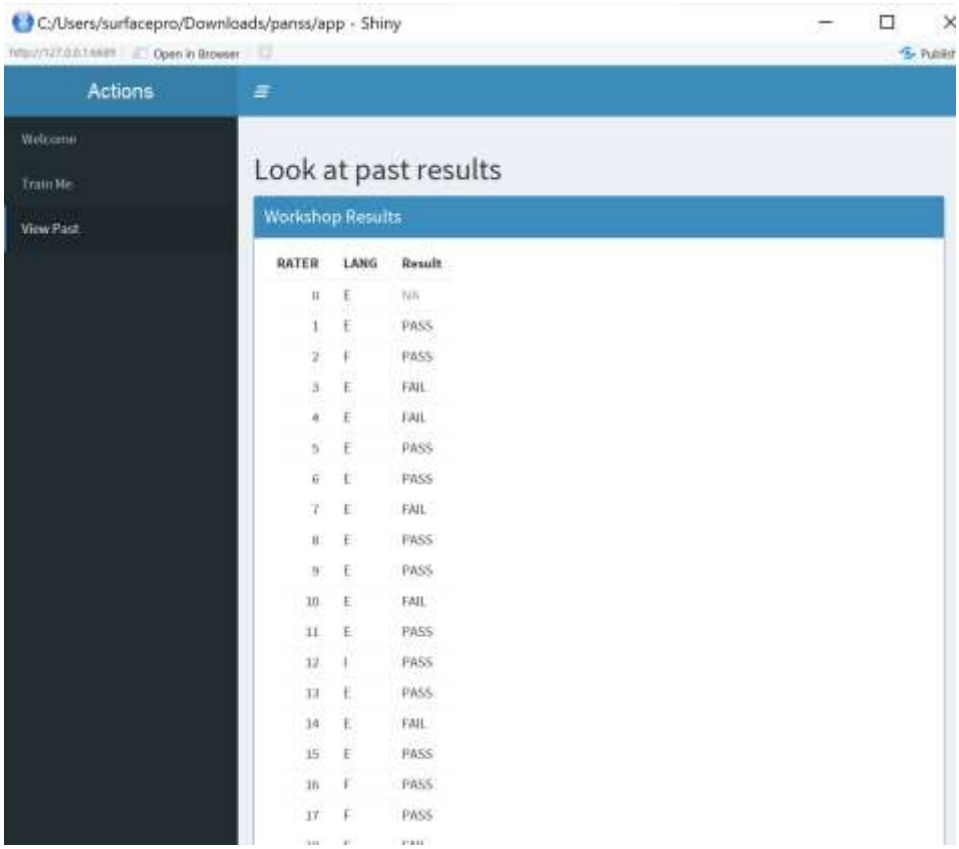


View Past Page

The view past page is a table summarizing the training performance of physicians using the PANSS instrument. It indicates the rater's identification code, language the test was written in, and their performance results. Specifically, it shows if the participant passed or failed the PANSS assessment based on the training questions. Refreshing the view past results page may reveal new training results from the PANSS assessment.

The figure below is a snapshot of the previous results from the workshop. Only the rater id, language, and results can be viewed to prevent the temptation to view answers. The values are stored in an SQLite database and cannot be modified by using the app. Once refreshed, if the user decided to save their response from the "Train Me" page, they will be able to view their results at the bottom of the table.

Figure 3. Look at past results



Does language have anything to do with passing the PANSS training?

Figure 4. R snapshot of the results from the Fisher's Test

```
> fisher.test(tab)

        Fisher's Exact Test for Count Data

data:  tab
p-value = 0.06039
alternative hypothesis: two.sided
```

From the results above, using the data provided by the initial 72 physicians, it was evident that Language did not have anything to do with passing the PANSS training. A Fisher's Test was conducted to test the hypothesis.

- H_0: the two categorical variables are independent, there is no relationship between language and test result.
- H_A: the variables are dependent, there is a relationship between language and test results.

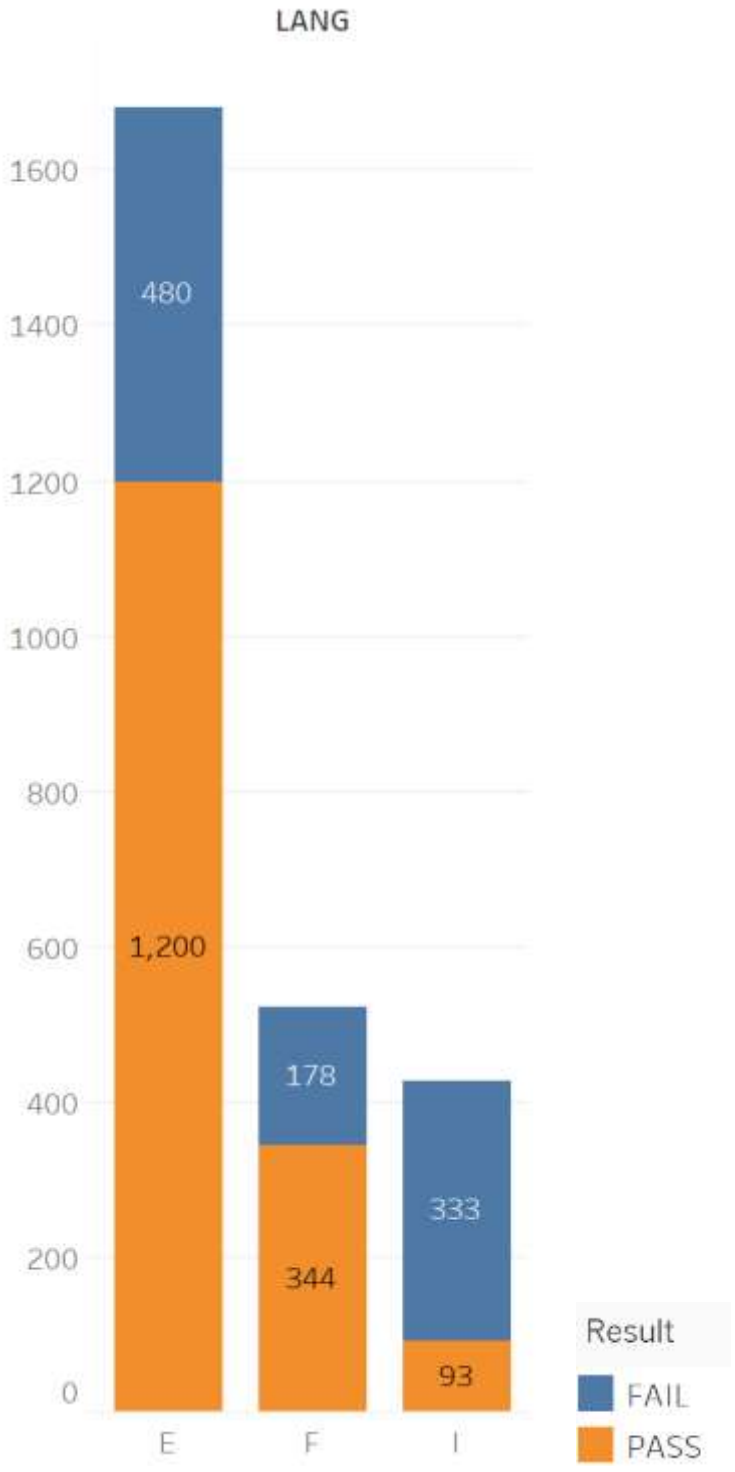
From above, since *p*-value = 0.06039 > 0.05, we failed to reject H_0. In conclusion language and test results are independent variables.

The visuals for the comparison for each Language with the Test results is shown below. As you can see, even though there is some difference in the Pass/Fail ratio between English versus French and Italian, this difference is not statistically significant to indicate the dependence between test results and language.

Figure 5. Count Data of Pass/Fail Stratified by Language

	LANG		
Result	E	F	I
FAIL	480	178	333
PASS	1,200	344	93

Figure 6. Bar chart of Pass/Fail Results by Language.



Conclusion

The Positive and Negative Syndrome Scale (PANSS) instrument is used to assess, and rate symptoms displayed in schizophrenic patients. PANSS instrument recognizes 30 of these symptoms: (7) negative symptoms, (7) positive symptoms and (16) generic symptoms. These symptoms are rated from 1 to 7; 1 indicating a low rating of psychosis and 7 indicating a highest rating of psychosis. It is imperative that PANSS is used appropriately and proper training measures are in place.

We have developed an app that can be used to teach the PANSS instrument to physicians in training. You may download the app by using the following link:

https://github.com/jfosea/panss

There you will find the R code needed to download and run the app as well as instructions on how to do so. Students will watch a 30-minute video of a patient and use the app to take the PANSS assessment. At the end of the assessment, feedback will be given to participants regarding their performance with PANSS.

Recommendations

To implement the data analysis system, please take the following into consideration:

1. Watch a 30-minute video of a patient before running and using the app.

   The app will be used to train physicians on how to use the PANSS instrument correctly by evaluating the symptoms of this patient.

2. Use RStudio to conduct the PANSS training.

   R studio is free and accessible to the public, making it a great software to use. It is also one of the most popular programming languages used in the industry and is very easy to download.

3. Refer to the website https://github.com/jfosea/panss to download the app.

   Be sure to follow all the steps in the manual found on the website to download and use the app correctly.

4. Refer to the Data Analysis System section of this report for detailed steps on how to implement the app.

   This is where you can find detailed instructions on how to download the app and run the PANSS assessment. It also indicates how participant feedback and results can be retrieved.

5. Consider using Canva to present the app.

   Canva is a free website that allows you to collaborate on presentation designs and products. It is also user-friendly and time efficient.

6. You cannot change actual values of the data that already exists from the app. To make actual changes to the data that already exists, you can use SQLite to access the private database. We suggest having at least one person from our team to be present during the workshop in order to help make changes in the database if necessary.

References

Chen G. Topic 5. *STAT 517*. 2021.

Colin, C. D., & Molinari, V. M. (2010). Positive and Negative Syndrome Scale - an overview. *ScienceDirect*. https://www.sciencedirect.com/topics/medicine-and-dentistry/positive-and-negative-syndrome-scale#:%7E:text=Positive%20and%20Negative%20Syndrome%20Scale%20(PANSS)%20is%20among%20the%20best,general%20psychopathology%20associated%20with%20schizophrenia.