Protocol study plan

VIRTUal Simulator mobile ApplicatioN (Virtusan), a fostering educational digital tool for empowerment of healthier lifestyle, challenging optimum dietary habits, physical and mental health, sleep status and quality of life. The VIRTUSAN Clinical Trial.

Introduction

Digital mobile applications can be potentially used as an alternative and effective educational method, to prevent and improve health risk factors, reducing sudden cardiac death and increasing quality of life and longevity rate. Virtusan application is a pioneer mobile application software, that interacts with the user in four predefined pillars, to educate and to improve dietary habits, sleep pattern and physical and mental health. Prospectively, Virtusan application can be used as a non-invasive, cost-effective and friendly user tool, to reduce the burden of diseases, providing multidimensional positive impact on the economical sustainability of the global health care system. The potentiality of the Virtusan application in the health status as a disease preventive educational digital tool, had been tested in medical students for a period of six months, detecting and proving vital changes in biochemical, clinical, physical and mental parameters after the use of application.

Aim and Scope

Aim of the current study is to evaluate the impact of Virtusan mobile application in lifestyle habits (sleep quality, mood, stress, diet, physical exercise and mental health) of adult health users, challenging the improvement of quality of life and the expected increase of longevity rate. Scope of the current study is to examine any positive correlation between the use of the four pillars method of the Virtusan mobile application and the improvement of health indicators (clinical, biochemical and mental parameters), after 4 months of continuing use of the application from medical students.

Materials and methods

The population of the study was composted by 60 medical students, 30 males and 30 females. The average age of the students was 23 years for males and 22 for females and the average body mass index (BMI) was 24.5 and 21.7 respectively. Students had been divided in two groups: The first group (Group A), composted by 30 students (15 males-Group A1 and 15 females-Group A2), used the application for 4 months and the second group (Control Group), composted also by 30 students (15 males-Control Group A1 and 15 females-Control Group A2), didn't use the application. Before and after the period of the 4 months, biochemical, BMI, blood tests, clinical indicators (blood pressure measurements, heart rate frequency) and mood questionnaires (Pittsburgh Sleep Quality Index, quality of life EQ-5D score, Profile of Mood States, State-Trait Anxiety Inventory score), were performed in the subjects of both groups.

Hematological and Biochemical blood work parameters were performed always in morning time (between 08:00 and 09:00 am), after 8 hours of night fasting from the biochemical laboratory of AHEPA University hospital, in which the following parameters were analyzed: white blood cell count (WBC), red blood cell count (RBC), platelet count, hematocrit (HCT), hemoglobin concentration (HB), red blood cell volumes, serum glucose levels, glycosylated hemoglobin, urea, creatinine, eGFR (glomerular filtration rate), uric acid, uric acid, calcium, phosphorus, alkaline phosphatase (ALP), cholesterol, triglycerides, high density lipoprotein (HDL) cholesterol, apolipoprotein B, lactate dehydrogenase (LDH), aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyltransferase (γ-GT), albumin, Na, K, Cl, proteins, globulin, albumin/globulin (A/G) ratio, Thyroid stimulated hormone (TSH), vitamin D,B.

A normalized sphygmomanometer was used for the evaluation of systolic and diastolic blood pressure. The measurements were performed by general practitioner doctor and only after a 5-minute period of rest of the subject in the sitting position, in a quiet and relaxed environment in standard ambient temperature (25 ^{o}C). Estimation of

the average heart rate frequency was performed by general practitioner doctors using pulse oximetry for 30 minutes after the subject was in sitting position for 5 minutes, in a quiet and relaxed environment in standard ambient temperature (25 ^{o}C).

Evaluation of sleep quality was performed by using the Pittsburgh Sleep Quality Index (PSQI), characterize by optimum psychometric properties and commonly recommended as an essential outcome measure in sleep studies. PSQI consist to self-report questionnaire with 19 items (scale range = 0 - 21) in which higher scores indicates low sleep quality and score > 5 separates poor sleepers from good sleepers.

EQ-5D is a standardized score for health-related quality of life estimation, developed by the EuroQol Group, providing a simple, generic questionnaire for use in clinical appraisal and population health surveys. EQ-5D assesses health status in terms of five dimensions and is considered as generic questionnaire, since these dimensions are not specific to any subject group or health condition. The scale of the self-estimated overall total quality of life score is from zero point (lower) to one hundred (higher).

Profile of Mood States (POMS) is a well-established measure score of psychological distress derived from factor analysis and its high levels of reliability and validity have been documented. This questionnaire contains 65 words/adjectives, describing several aspects of mood and classified in six subscales: tension, depression, anger, vigor, fatigue and confusion. The vigor subscale refers to the positive state of mind and the other factors to the negative one. Each item is valued following a likert-type format with five alternative responses: not at all (0), a little (1), moderately (2), quite a bit (3) or extremely (4). The subscales are combined for a total mood score, in which the total mood disturbance score is calculated by summing the totals for the negative subscales (tension, depression, fatigue, confusion, anger) and then subtracting the totals for the positive subscales (vigor and esteem-related affect). The range of the Poms score for tension-anxiety is from zero to thirty-six (0-36), for depression-dejection from zero to sixty (0-60), for anger-hostility from zero to forty-eight (0-48), for fatigue-inertia from zero to twenty-eight (0-28), for confusion-bewilderment

from zero to twenty-eight (0-28) and for vigor-activity from zero to thirty-two (0-32).

The State-Trait Anxiety Inventory (STAI) is a psychological inventory consisting of 20 self-report items on a 4-point Likert scale. The STAI score measures two types of anxiety: state anxiety (Y1 version) and the trait anxiety (Y2 version). The Y1 version is addressing 20 items for the state anxiety. The Trait Anxiety Inventory is widely used to measure anxiety symptoms and is assessed on how the subjects generally feel. The total score range is from 20 to 80 and classified as low anxiety (scoring 20-37), moderate anxiety (scoring 38-44), and high anxiety (scoring 45-80).

Statistical Analysis

The index of improvement it will be the average difference in BMI, blood tests, clinical indicators (blood pressure measurements, heart rate frequency) and mood questionnaires (Pittsburgh Sleep Quality Index, quality of life EQ-5D score, Profile of Mood States, State-Trait Anxiety Inventory score) after the use of the Virtusan application in Group A and in the control Group. The difference will be expressed as statistical difference with statistically significant threshold of 0.05. For the statistical analysis the IBM spss software will be used and the student's t-test analysis between groups will compare the means of the groups, before and after the intervention. A subgroup analysis will be performed based on sex (male and female subgroups) for the observed parameters before and 4 months after the use of Virtusan application.