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Development of a Simulation Model of the Negative Impacts of Marijuana Intake in Human Population Using Empirical Data

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ABSTRACT

The aim of this work is to create a simulation model that can anticipate and detect marijuana's harmful effects on users. Marijuana consumption has continued to have a harmful impact on the human population, according to recent studies. This research focuses on the effects of marijuana consumption on consumers' academics, health, physical, psychological, and social development in the hopes of finding a long-term solution to the problem. The study was prompted by the detrimental effects of continued marijuana addiction, as well as the long-term ramifications for our youth's development and the nation's economy if it is not controlled. During a six-month period, teenage and young adult male and females between the ages of 15 and 35 participated in the demographic study. Age, Gender, Race, Educational Qualification, Marital Status, Marijuana Dependency, Tobacco Dependency, Anxiety Sensitivity, and Psychopathology Results using Audio Tape are the primary variables of interest.

KEYWORDS: Marijuana, model, adolescent, Simulation,

INTRODUCTION

Marijuana is the most widely used illicit substance in the world, and it is also the easiest to obtain. Marijuana is consumed by 147 million individuals, or 2.5 percent of the world's population, compared to 0.2 percent who use cocaine and 0.2 percent who use opiates. In many nations, the term'marijuana' is commonly used to refer to cannabis leaves or other crude plant material. Tetrahydrocannabinol (THC) is the psychoactive component of cannabis (THC).

Marijuana abuse is becoming increasingly common among this generation's kids. Although recreational drug use is prohibited in most nations, some of these substances are readily available. But why do they seem to be in such high demand? Red eyes, increased hunger, dry mouth, paranoia, memory loss and inability to focus, hallucinations, and other side effects are common. If not regulated, these impacts could result in a greater risk to one's health. Continuous progress in research and understanding of ways to reduce the threat of marijuana use in the human population is required. We developed a model for marijuana misuse in this thesis that explains the dynamics of marijuana abuse in human populations. The drug model will be objectively and qualitatively evaluated. The substance misuse (drug) threshold will be established.

LITERATURE REVIEW

So many peer-reviewed research on the health consequences of marijuana have been released recently. At various degrees of marijuana usage, nearly all of these research discovered unfavorable health effects in a dose-dependent way (infrequent to daily use). It's worth noting that the potency of marijuana was practically never considered in those publications. This chapter examines related research literature and is divided into five sections: i. Effects of marijuana use on the development of our youth. ii.Modeling and Simulation Concepts Theoretical Framework iii. Recommendations for additional reading. iv.Sample collecting procedures in the laboratory v. Literature deficiency.

METHODOLOGY

Modelling and Simulation Concepts

Without computers to collect data and execute model simulations, modern science would be impossible. Computers have considerably increased our understanding of the world and our ability to transform ideas into technical realities.

Modelling- The process of creating abstract, conceptual, graphical, and/or mathematical models is known as modeling. Science is accumulating a growing body of knowledge on all types of specialized scientific modeling, including methods, techniques, and theory. A model is a depiction of a real-

world phenomena or element (physical or hypothetical) (objects, concepts or events). A model, to put it another way, is an attempt to express a potential structure of physical causality.

Modelling and Simulation is a discipline for developing a level of understanding of the interaction of the parts of a system, and of the system as a whole.

A computer model is a simulation or model of a situation in the actual world or an imaginary one that the user can change the parameters of.

Newton, for example, studies movement (of planets and masses) and develops equations such as f = ma (where f represents force, m mass, and an acceleration) to explain the dynamics. Models assist us in framing our thinking about real-world items. It's worth noting that we frequently model dynamic (changing) systems.

Type of Models

The figure 1.0 describes different kinds of model according to Ekwonwune (2012)

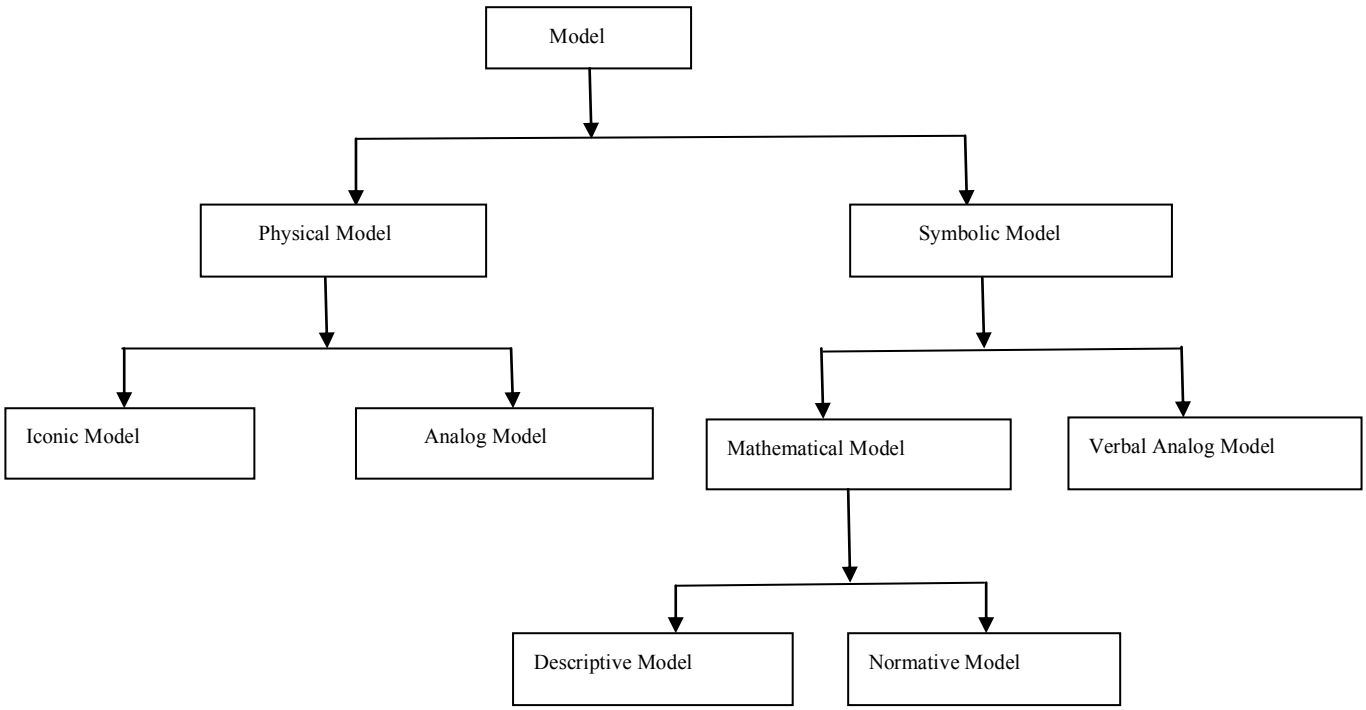

Fig 1.0

There are many different sorts of models and classifications/groupings to choose from. Physical, Mathematical, Analogue, Simulation, Heuristic, Stochastic, and Deterministic models can be combined together for ease of understanding.

a. Physical Models

These are call iconic models. A model railway can be used to study the behavior of a real railway.

In simulation studies, iconic models are rarely used.

i. **Iconic Model:** the reason for modeling, what one envisions for modeling- a sealed model or a physical reproduction of the model, all geared to elicit feedback, such as a construction plan model.
ii. **Analog Model:** a graphical view of a physical thing that is represented in graphs, charts, the design of a construction plan, and so on, and which is used to define authority and responsibilities in the model..

b. Symbolic Model: an abstract model that depicts the relationship between variables (X1, X2, X3,.....Xn) that can be changed. Such a model is useful for analysis and forecasting, as well as computer and mathematical design..

c. Mathematical Models

These are models that are used for forecasting (projecting). They are mathematical expressions of relationships that are abstract. Consider the following

examples:

1. $x^2 + y^2 = 1$ (mathematical model of a circle of radius 1)
2. Linear programming models and so on.

The development of mathematical models requires great deal of skill and knowledge.

i. **Descriptive Model:** In this model, events are reported exactly as they occur. It examines potential areas for change and investigates the implications of various decision options. It provides a framework for analysis to assist the decision-maker in choosing an option

ii. **Normative Model:** This model is also known as an optimization decision model since its goal is to find the best option for a given set of circumstances. It is used to determine the best available option based on a set of decision criteria

iii. **d. Analog Model:** a graphical perspective of a physical thing that is represented in graphs, charts, a building plan design, and so on, and which tends to identify authority and responsibilities in the model. .

Modelling Procedure

In modeling, we construct a suitable representation of an identified real world problem, obtain solution(s) for that representation and interpret each solution in terms of the real situation. The steps involved in modelling are as follows:

1. Examine the real world situation.
2. Extract the essential features from the real world situation.
3. Construct a model of the real (object or system) using just the essential features identified.
4. Solve and experiment the model.
5. Take a final decision or conclusion on the model.
6. If a further refinement necessary, then re-examine the model and readjust parameters and continue at 4, otherwise continue at 7.
7. Move to the implementation.

Structured Systems Analysis and Design Methodology (SSADM): This is adopted because it is a standard information system development method that takes a top-down approach to system development, in which a high level picture of system requirements is built and then gradually refined into a detailed and rigorous system design. The steps include:

i. Problem identification: Here we identify the problem to solve…
ii. Feasibility study: we carried out feasibility study at FMC Asaba
iii. Analysis
iv. Design
v. Implementation
vi. Post implementation maintenance

SSADM specifies exactly the flows and tasks of a development project and produces a detailed documentation of the project. The benefits are that this prescribing methodology theoretically offers are mainly the following; Timelines, Usability, Respond to changes in the business environment, Effective use of skills, Better quality, Improvement of productivity and reduced costs

Methods of Data collection

At the Federal Psychiatric Medical CenterAsaba, we conducted a prospective study for marijuana-impaired patients. During a six-month period, teenage and young adult male and females between the ages of 15 and 35 participated in the demographic study. Age, Gender, Race, Educational Qualification, Marital Status, Marijuana Dependency, Tobacco Dependency, Anxiety Sensitivity, and Psychopathology Results using Audio Tape are the primary variables of interest. The patients' social demographic factors, smoking history, nicotine dependency, and hospital anxiety and depression scale level will all be investigated using a questionnaire. To find determinants of smoking relapses in Marijauna-impaired patients, regression analysis will be employed. SPSS Statistics and Matlab Software will be used for all analyses.

Audio tape, SPSS Statistics Software, Heavy Metal Testing, Liquid Chromatography with Mass Spectrometry (LCMS), Gas Chromatography with Mass Spectrometry, and Matlab Software will be employed in the data collection of parameters of testing Marijuana impaired patients at FMC Asaba Delta State. To identify the parameters of the logistic model l, Matlab curve fitting features are employed.

Thus depending on the purpose of the testing, biological specimens for drug testing include the following:

Biological specimens for drug testing include the following, depending on the testing purpose:

Blood testing is the "gold standard" for detecting the presence of drugs (Marijuana) in those who are impaired. However, the capacity to link the amount of a drug or metabolite in blood to the presence and severity of impairment is currently restricted. It should be emphasized that this type of study does not normally entail the measurement of blood THC levels; rather, the individuals' performance in non-dosed (placebo) and dosed (when given marijuana) trials is compared. There are likely to be significant disparities in blood THC levels between marijuana blood patients and non-marijuana blood patients as a result of these differences.

Oral Fluid Testing–Collecting oral fluid is a non-invasive and effective method of identifying a wide range of medications. Oral fluid collection devices for laboratory testing appear to be a reliable way to check for recent drug usage. The technology for collecting oral fluid swiftly, correctly, and consistently at the moment of arrest is constantly evolving. Some firms sell self-contained test kits that law enforcement can employ; however, these point-of-arrest screening technologies have not been proven to be 100% accurate and reliable. Marijuana (THC) is easily detectable in oral fluid, although there are still challenges in distinguishing use from environmental exposure.

Perspiration Testing– A cumulative record of prior drug use can be created by collecting sweat over time. A positive sweat test result, on the other hand, cannot be used to prove impairment at the time of an arrest or crash. Sweat testing offers no benefits over oral fluid testing and is prone to contamination.

Hair Testing– Although hair samples can be tested for drug use, the results are of little use in drug-impaired driving situations. Hair test results that are positive cannot be used to prove drug usage while driving. Furthermore, differences in hair growth and the addition of substances to the hair, such as coloring products, make it difficult to infer when drug use happened and may impact the results. THC can be identified in hair, but it can also be caused by environmental exposure (e.g., marijuana smoke) and result in a positive hair test result.

Urine Testing– The urinalysis drug testing methodology is well-established. For several days after a drug has been consumed, drugs and drug metabolites can be detected in urine (and sometimes for weeks). THC or other cannabinoids detected in the urine may not always indicate recent marijuana use.

Material and Model Development approach

The following devices will be used, indicating the parameters of testing Marijuana impaired patient at FMC Asaba.

- Heavy metal testing
- Liquid Chromatography mass spectrometry (LCMS)
- Matlab Software

Map of the Environment under Study

Analysis and Modeling of the Proposed System.

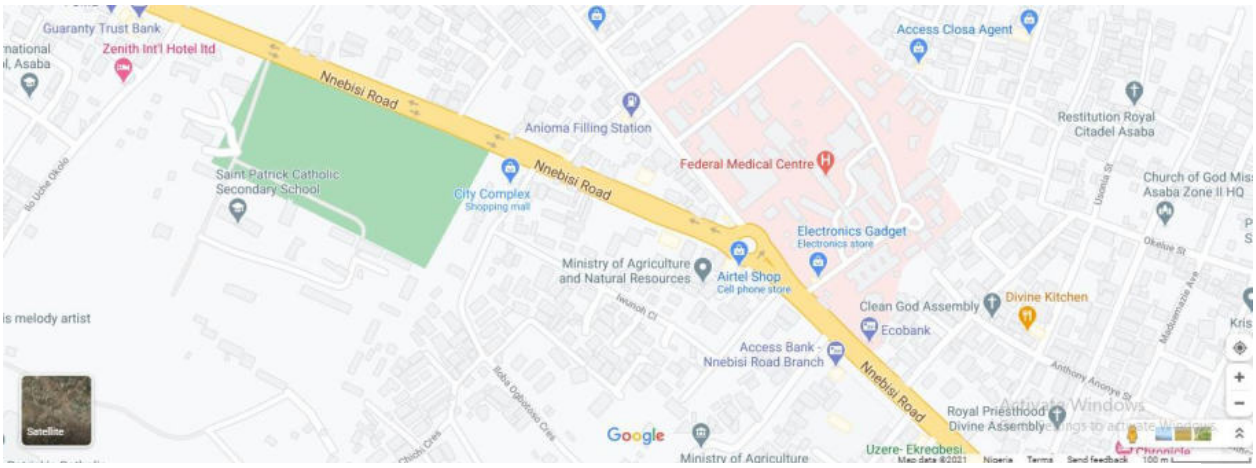

Figure 2.0: Map of the Environment under Study

This offers a quantitative description of learning and memory abilities when a participant is exposed to marijuana.

In our model we examine the dynamic of population of drug users in a heterogeneous population. The population is stratified into four (4).

a. Those at risk of using drugs (susceptibility) denoted as S
b. Lighter users denoted as L
c. Heavy users denoted as H

d. Drug user on treatment denoted as T

Thus the total variable population size at any time t is given as:

$N(t) = S(t) + L(t) + H(t) + T(t)$ **1.0**

We undertake that the individual in each compartment are indistinguishable and there is regular mixing, the model assures that individual joined the susceptible population at rate through birth and immigration.

Secondly, the mathematical background of the application of the transfer function of the first order linear system in response to a stepwise input action for assessment of the learning curve. During a free memory test at FMC Asaba , presentation of a list of words acts as stepwise input signal that begin to act upon a participant under testing for the first time on the first trial. The first order transfer function for assessment of learning curve is the form of equation 2.0

$Y= B_3 e^{-B2(X-1)} + B_4(1-e^{-B2(X-1)})$…… **2.0**

Where

X = is trial number

Y= is the number of correctly recalled words without repetition

B_2 = Learning Rate

B_4 =the asymptotic value of recalled words at X= infinity

B_3 = Number of correctly recalled words on the first trial (i.e B_3 =Y at X=1).

The same nomenclature is used if memory test is used. Use of the independent variable in the form (X-1) means that the first trial at X=1, assesses auditory attention span or background readiness to learn. Learning itself begins when the list of words is presented repeatedly.

CONCLUSION

The following contribution to the ICT body of knowledge will be made by developing a simulation model that will predict and detect the detrimental effects of marijuana consumption in the human population.

• The model that may be used to evaluate the influence of marijuana on human learning and memory. A crucial feature of our model is that it focuses on individual performance, allowing the researcher to make a clinical assessment at the individual level.

• If appropriately developed, the model can be simply included into numerous experimental designs and used to enhance traditional statistical testing.

• The proposed model may be used by researchers and clinicians who want to model the learning curve when monitoring memory in marijuana users. It can also be used by persons who want to keep track of their memory on their own.

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