

A Study on the Correlation Between Emotion and the Quality of Life of the Elderly Under the Artificial Intelligent Smile Recognition System: Protocol for a Descriptive Study

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Abstract. With the aging of the population, the senior people's quality of life has become a hot issue in China and even in the world. This study, with emotion as the core, evaluated the senior citizens' quality of life in the form of scales to explore the relationship between emotion and human health. Artificial intelligent identification system has developed rapidly in this society and has made great contributions to the development of human society. Combining artificial intelligent identification system with medicine will contribute to the development of human public health, which is of great significance and value.

Keywords. Elderly, emotion, AI smile recognition system, quality of life

1. Introduction

With the aging of the population, the senior citizens' quality of life has become a hot issue of global concern. Quality of life refers to the individual's feeling experience of his own physical condition, psychological function, social ability and personal comprehensive condition in different culture and value system [1]. The physical and mental health status of the elderly, the relationship with the family and society are important factors affecting the senior citizens' quality of life population [2-4]. The

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elderly group is more likely to produce emotional loneliness than the young people, and the senior citizens' quality of life is often negatively affected by the gradual decline of various functions of the body and the loss of interpersonal relationships [5]. From many factors that may affect the senior citizens' quality of life, this study selected emotional factors as the core of the study, aiming to explore the impact of emotion on the senior citizens' quality of life.

In order to explore the relationship between emotion and the life quality, we must judge the emotion of the participants. So we use the artificial intelligent smiling face recognition system to identify the photos of the participants. After comprehensive analysis, the participants will be judged as positive or negative personalities. In the early stage of the project, we cooperated with the Institute of Deep Learning of Northeastern University in the research of face recognition and facial expression classification, and completed the scientific research platform of facial expression intelligent recognition based on convolutional neural network. Next, the two sides will work together in the clinical, big database, methodology and other areas of further in-depth cooperative research, expected to conclude the correlation between subjects' emotions and physical health. Combining artificial intelligent identification system with medicine will contribute to the development of human public health, which is of great significance and value [6-8].

2. Methods

The objectives of this study are as follows: By using the AI smiling face recognition system to identify the photos of the elderly population for nearly a year. In recent years, there are studies about the scale and the application of various scales in medicine has become more and more mature, this study selected SF-36 scale to evaluate the senior citizens' quality of life [9]. SF-36 quality of life scale was developed by Boston health institute, USA. This study used the Chinese translation version of the social medicine teaching and research office of Zhejiang University medical school as a health evaluation tool for participants in this topic. The quality of life of each participant will be evaluated from 8 dimensions. And through the scale evaluation, the quality of life of the elderly will be evaluated so as to analyze the relationship between the quality of life and emotion of the elderly. The AI system workflow is shown in Figure 1. A three-aspect correlation study in Figure 2 was performed after the system calculated the percentage of smiling photos in the subjects' photographs.

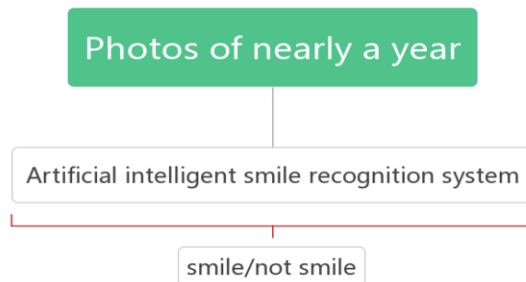


Figure 1. AI system workflow chart.

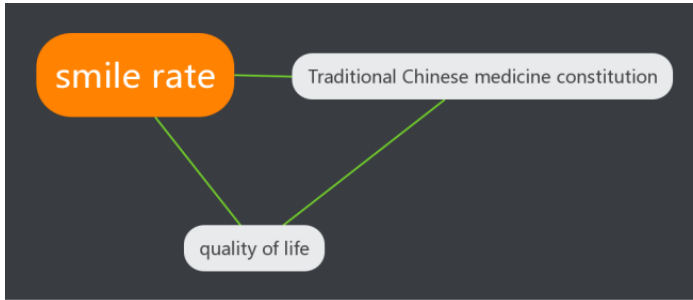


Figure 2. Correlation study

3. Study Design

This is a multicenter, retrospective, descriptive study. The study was completed by Liaoning University of Traditional Chinese Medicine in cooperation with Northeastern University.

AI smiling face recognition process: the realization of AI smiling face recognition function is divided into the following three steps:

- Uniform picture size and format.
- Image capture of mouth and surrounding parts.
- Image recognition.

AI Smiling Face Recognition System Principle: We use a convolutional neural network (CNN) to build the model, which has eight layers, consisting of five convolution-pooling layers and three fully connected layers. CNN has three main components, including convolutional layer, pooling layer, and fully connected layer [10-11]. The convolutional network can adapt well to the small-scale translation of the image, that is, it has good translation invariance [12].

Original image is input into the CNN structure after regularization. Each neuron in each layer takes the output of the previous layer as input. CNN obtain feature maps through convolution operations, which can represent different image features. There are always more than one feature maps in the convolutional layers, thereby retaining the richer features of the image. After the convolutional layers, pooling layers are used to downsample image, which reduces the image resolution and the amount of parameters, moreover, it obtains the robustness of translation and deformation. As the growing of convolution layers and pooling layers, the number of feature maps increases, and the resolution decreases. Finally, the probability of different categories is output directly through the full connection layer, and the classification result is given at the output end.

Sampling design and setting: The sample size refers to the sample size estimation method of multivariate analysis, and the sample size required is generally 5-10 times the number of independent variables. In order to ensure the quality of the research, learn from the existing research, and consider the feasibility factors such as research cost and research cycle, a total of 200 samples were selected in this survey.

Inclusion criteria: (1) Older persons ≥ 60 years of age; (2) Plenty of photos for the past year; (3) Voluntary participation in trials and signature of informed consent for clinical investigations.

Exclusion criteria: (1) Plenty of photos for the past year, but most of the photos face occlusion or poor photo quality, AI the system cannot identify the person; (2) A person with a special face arising from a special illness; (3) Complicated with advanced malignant tumor, mental illness and severe neurosis.

Informed consent and basic information gathering: Before participating in the trial, the researcher will send the informed consent notification page and the signature page to the participants, which contains the contents, significance, procedure, risks and interests of the clinical study of the project. Fully understood, the participants and researchers will sign the confirmation on the signature page. Participants need to provide basic information to the researchers for later statistics and follow-up.

Assessment of participants' quality of life: Reference to expert opinions, combined with the reliability and validity evaluation of various quality of life scales, this experiment selected SF-36 quality of life scale to evaluate the quality of life of participants [13-15]. The scale assessed participants' quality of life from eight dimensions: bodily pain (BP), role physical (RP), physical functioning (PF), general health (GH), vitality (VI), mental health (MH), role emotional (RE), and social functioning (SF). The first four dimensions mainly reflect the degree of physical health (PCS), and the latter four dimensions mainly reflect the degree of mental health (MCS).

Completion of participants' quality of life scale: In order to ensure the accuracy of the assessment of participants' quality of life, the researchers were responsible for explaining the items in the scale and asking questions to the participants one by one. All the results were recorded by the researchers, and checked the items separately.

SF-36 scoring methods: First of all, each item is coded, the answer checked by the participants is scored, and the eight dimensions are respectively converted according to the score conversion formula. The higher the score after the conversion, the better the status of the participants in this dimension.

Data management: (1) The participant's previous photo information is voluntarily provided to the researcher by the participant himself. The researcher should ensure the privacy of the photo, after being identified by the AI smiling face recognition system, the original photo is archived, and the AI identification results are accurately and timely recorded and transferred to the data administrator. (2) Quality of life scale (SF-36) will be completed by clinical researchers. Clinical researchers should ensure that the data are accurately, completely and timely loaded into the quality of life scale (SF-36), while keeping the original records, and the data administrator is handed over after the completion of the above scale is reviewed by the clinical inspector; (3) To ensure that the data are true and valid, participants are required to specify the date of completion of the form and the specific time taken to complete the form.

Data statistics: Collate the questionnaire, use the SPASS23.0 software for data collation and analysis. The general data of participants will be analyzed by frequency and percentage. By means of mean, standard deviation and rate, the smiling photo proportion, emotional state and quality of life will be analyzed. A single-factor analysis of participants' emotions is with two independent samples t test or variance analysis. A partial correlation analysis will be used for the correlation between participants' emotions and their quality of life.

Quality control: Researchers must undergo uniform training, uniform recording and judgment criteria. All observations in clinical trials should be verified, and the conclusions in clinical trials are derived from the original data.

4. Discussion

This is a retrospective study. By appropriate methods, our study will give a comprehensive answer to the association between emotion and senior citizens' quality of life. In China, and even in the world, the number of elderly people is increasing year by year, and the study of the elderly people's life quality should be more detailed [16]. The senior citizens' life quality includes, but not only includes, physical health status. This study not only explores the influence of emotion on the quality of life of the senior, but also explores the relationship between occupation, marital status, living conditions and the emotions of the elderly, thus providing a variety of ideas for improving the senior citizens' quality of life [17-18].

Our study has some limitations, and the 200 participants selected from different centers and regions are still the majority of participants in Northeast China. Besides, the AI intelligent smiling face recognition system used in this study is not ideal for image recognition with occlusion and side, and is not good for some images with small smile amplitude.

5. Trial Status

The trial is ongoing and currently recruiting.

6. Ethics

This trial is conducted in accordance with the Helsinki Declaration and relevant Chinese clinical trial research norms and regulations. The study was reviewed and approved by the Ethics Review Committee of Chinese Registered Clinical Trials (ChiECRCT20200010). Written informed consent of all participants will be obtained before data collection.

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