Universitat d'Alacant
Universidad de Alicante

MINISTERIO
DE ECONOMÍA, INDUSTRIA
Y COMPETITIVIDAD

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# *Predictive models of the morphological evolution of the human body to improve adherence and motivation in dietetic-nutritional treatments of overweight and obesity. Tech4D-Predict*

## **REFERENCE:** PID2020-119144RB-I00

## ***NCT NUMBER:*** *PENDING*

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# RESEARCH PROJECT PROTOCOL

## 1. Project Title

*"Predictive models of the morphological evolution of the human body to improve adherence and motivation in dietetic-nutritional treatments of overweight and obesity. Tech4D-Predict."* **REFERENCE:** PID2020-119144RB-I00

## 2. Principal Investigator

Jorge Azorín López.

## 3. Summary

**Backgroud**: This project is framed within the improvement of obesity treatment from a multidisciplinary perspective, leveraging the potential of rapidly developing areas such as 3D modeling and virtual reality to address open challenges, including the psychological aspects of treatment adherence, creating opportunities both in dietary-nutritional intervention and in tackling new technological challenges.

Currently, more than 50% of the Spanish population over 18 years old suffers from overweight or obesity, contributing to the development of multiple chronic diseases (hypertension, diabetes, cancer, etc.) and to the loss of cognitive and functional capacity. This situation results in a decreased quality of life and a significant increase in healthcare costs. Disease-related expenses range from 0.09% to 0.61% of the annual GDP at the European level. Lack of adherence to treatment has been considered one of the main causes of failure in intervention programs, turning obesity into a chronic condition. Improving adherence would enhance treatment outcomes and their long-term maintenance, directly impacting healthcare cost savings. Recent research shows that lack of adherence can be improved through the use of multimedia technologies to reinforce the cognitive experience. However, there are no studies that exploit the maturity of 4D modeling and virtual reality technologies for this purpose. These findings suggest that obesity treatment can be enhanced through the use of 4D body visualization systems, which improve the patient's cognitive experience during weight loss, increasing adherence. Additionally, introducing a multidimensional component opens new avenues for studying more precise metrics to quantify treatment effects.

**Objective:** The main objective of this research project is to develop a 4D visual representation model of the human body that allows the analysis of morphological changes resulting from obesity treatment. This 4D model will serve as the core of a body visualization system aimed at improving obesity treatment. The system will provide immersive virtual reality visualizations and personalized simulations of body

evolution during treatment. Furthermore, the effect of these realistic visualizations on patient motivation and adherence to treatment will be studied.

**Method:** The proposed methodology for obtaining the morphological change representation model presents a significant research challenge. The multidisciplinary intervention combines clinical, psychological, and technological assessments in patients with overweight or obesity. The body is captured in 3D using RGBD sensors to create complete body models, and 4D models reflecting morphological changes over time are generated using advanced deformable registration techniques. These models feed a predictive system that anticipates body evolution under different dietary-nutritional scenarios, facilitating immersive virtual reality visualizations to improve motivation and adherence.

A longitudinal study design is proposed, with two groups (experimental and control) and evaluations at baseline and after six months. Clinical, anthropometric, psychological, nutritional, and technological data will be collected using validated questionnaires and precise measurements.

The analysis includes health indicators, cognitive functions, emotional well-being, and adherence, aiming to validate the system and its impact on motivation and clinical outcomes. Both classical and advanced statistical analyses will be performed, combining traditional methods (t-tests, ANOVA, regressions) with machine learning to predict body evolution, clinical parameters, and adherence. Sample losses will be controlled, and psychological variables will be evaluated as predictors of therapeutic success. Tools such as SPSS, R, Python, TensorFlow, PyTorch, Unity 3D, and Blender will be used.

## 4. Antecedentes, planteamiento del problema, justificación de la investigación

Overweight and obesity are defined as abnormal or excessive fat accumulation that is detrimental to health. The prevalence of overweight and obesity has increased worldwide, tripling over the past three decades in European Union countries [1]. In Spain, according to data published by the National Health Survey, the prevalence of these conditions in the population over 18 years old is 53.7% [2]. In developed countries, a shift in nutritional patterns has been observed, characterized by higher consumption of fats and refined foods. These dietary changes, which contribute to overweight and obesity, are associated with the development of chronic diseases such as hypertension, type II diabetes, cancer, and neurodegenerative disorders like Alzheimer's disease or dementia [3], [4], resulting in a higher risk of premature death, reduced quality of life, and increased frequency of healthcare visits.

The treatment and healthcare follow-up required for patients with overweight and obesity has a significant impact on healthcare costs. At the European level, it is estimated that expenses associated with the burden of obesity range from 0.09% to 0.61% of total annual GDP, representing an absolute cost of approximately €10 billion per year [5], [6]. This trend is also observed in Spain, showing a stable pattern similar to that found in other developed European economies [7].

Currently, most intervention programs for overweight and obese patients have focused on dietary-nutritional recommendations and promotion of physical activity [8], [9]. While these programs have generally been effective for short-term weight loss, their long-term effectiveness in maintaining weight is limited. Adherence to treatment has been identified as a key factor influencing the duration of treatment and the outcomes of interventions in these patients [10]. Recent studies have shown that high body mass indices (BMI) in obese patients and low adherence to treatment correlate significantly with levels of depression, anxiety, and the presence of cognitive impairments, particularly memory deficits, attention alterations, and poor executive function [3], [11], [12]. These impairments manifest as poorer decision-making, more disinhibited behavior, and inflexible patterns in controlling recurrent thoughts about high-calorie foods [11]. Evidence also shows that long-term nutritional interventions aimed at reducing caloric intake and weight in obese patients produce significant improvements in brain function and reduced oxidative stress when combined with regular physical exercise and adequate adherence to treatment [4]. For instance, a recent study in overweight patients demonstrated that an intensive 6-month nutritional intervention improved participants' general health, BMI, and cognitive function [3].

Given the evidence that lack of adherence is a major cause of intervention failure, improving adherence in patients with overweight and obesity would enhance treatment outcomes and their long-term maintenance, reducing healthcare costs.

Some authors have suggested that nutritional interventions reinforced through technology-based follow-up achieve sustained beneficial effects [12]. A review of 15 studies on interventions for overweight and obese patients found that 60–80% of participants achieved significant long-term weight reduction when interventions were reinforced using interactive multimedia devices [13].

These results highlight how lack of adherence can be improved through the incorporation of image-based techniques (2D) showing the patient's progress during dietary treatment, which enhances the cognitive experience [14]. However, to our knowledge, no studies have yet exploited or quantified the potential of realistic 3D images and virtual reality techniques to reinforce adherence and follow-up over time in overweight and obese patients.

In recent years, 3D models have begun to be applied in healthcare to analyze parameters related to body volume and shape in obese patients [15], [16]. These approaches complement traditional BMI-based treatments with new anthropometric indicators, such as the Body Volume Index (BVI), which is based on the 3D shape of the body [17]. However, most of these studies have been limited to static measurements, without considering temporal body evolution (4D) or changes resulting from dietary treatment.

3D scanning, initially developed for the textile industry [18], has shown great potential in healthcare applications such as epidemiology, diagnosis, and monitoring [19]. For example, body shape measurements have been used to address the increasing prevalence of obesity [20]. Companies such as Naked.fit offer body visualization and tracking in the fitness domain. Other systems like Fit3D use a single camera but require complex and expensive equipment. Body Labs also models the body in 3D, but without incorporating the temporal dimension. Some solutions focus on avatars or 3D printing, although they usually involve bulky equipment.

Regarding sensors, laser-based devices (LiDAR, ToF) offer high depth accuracy but no color. Stereo cameras require precise calibration and are expensive. RGBD cameras (such as Microsoft Kinect or Intel RealSense), which combine color and depth using structured light or ToF, are gaining popularity due to their accuracy, portability, and low cost, facilitating integration into consumer mobile devices.

Virtual reality has also advanced significantly in recent years. Head-mounted displays (HMDs) allow immersive experiences, and solutions such as Google Cardboard have drastically reduced costs. Numerous studies highlight VR's ability to enhance concentration and adherence in learning processes [21], which could be useful in treatments for overweight patients.

The state-of-the-art review shows an urgent need for effective solutions against obesity, given the limited effectiveness of traditional treatments. 3D/4D technology is mature in other fields, and low-cost RGBD devices are becoming popular. Likewise, VR has proven useful in multiple applications. However, these technologies have yet to be integrated to address temporal morphological changes (4D), nor combined with VR in obesity treatments. This presents significant scientific challenges for multidisciplinary research

## 5. Objective(s)

The general objective of **Tech4D-Predict** is to develop methods for the acquisition and visualization of 4D human body models, aimed at supporting dietary-nutritional interventions and enhancing long-term patient motivation and adherence to treatment. Furthermore, the study will evaluate the impact of this tool on cognitive function and psychological well-being.

In pursuit of this overarching objective, the following specific aims are defined:

- **Specific Objective 1: Development of flexible methods for the acquisition of 3D human body models. The goal is to equip the acquisition system with flexibility, robustness, and portability without compromising accuracy.**

Flexibility refers to the system's ability to tolerate subject movements during the acquisition process, and even to leverage these movements to capture multiple views of the subject in order to complete the 3D model. The ultimate aim is to progress towards 3D self-portraits. Portability involves the ability to easily transport the system/device, using a compact set of RGB-D cameras integrated into a readily transportable device. Robustness refers to the stability of the acquisition system against potential movements that could affect camera calibration, as well as variations in acquisition conditions (e.g., lighting).

- **Specific Objective 2: Development of methods for obtaining multidimensional predictive models of morphological and clinical body evolution during dietary-nutritional treatment.**

The aim is to move beyond 4D memory-based models, which visualize the morphological changes experienced by the body during treatment, towards multidimensional predictive models that anticipate potential morphological changes and clinical outcomes for specific patient profiles. These predictions will be based on prior experience, the 4D morphological models of patients from the current project, and their corresponding clinical data.

- **Specific Objective 3: Evaluation of the effectiveness of multidimensional predictive model visualization on patient motivation during treatment and its impact on long-term adherence.**

The primary aim of this objective is to assess the impact of the methods developed in **Specific Objectives 1 and 2**—related to 4D model acquisition and visualization, and the construction of predictive models of clinical and morphological evolution—within a real clinical setting through a patient intervention.

Accordingly, this objective encompasses the implementation of a clinical trial **with two intervention groups (experimental and control)** designed to evaluate the effect of a personalized intervention combining the benefits of 4D body modeling and virtual reality techniques with a dietary-nutritional treatment based on the Mediterranean Diet. The intervention aims to enhance motivation for change, treatment adherence, and health parameters in overweight and obese patients.

Furthermore, this study will allow systematic collection of clinical, anthropometric, nutritional, and psychological data, which will be integrated into the multidimensional predictive model to improve its precision and personalization capabilities.

Specifically, the clinical trial includes the following specific aims:

- To study how a 4D computer vision model combined with virtual reality technology can improve clinical assessment, the analysis of temporal morphological changes of the human body, and adherence to dietary-nutritional treatment.
- To evaluate whether adherence to an intensive multifactorial dietary-nutritional treatment based on the Mediterranean Diet, supported by immersive 4D virtual reality technology, leads to improvements in cognitive functioning.
- To analyze the impact of a nutritional intervention program based on the Mediterranean Diet and the use of virtual reality on body image perception.
- To determine whether a combined intensive intervention—based on the Mediterranean Diet and 4D virtual reality technology—can improve patients' overall health.

## 6. Methodology

The intervention follows a multidisciplinary approach that combines clinical, psychological, and technological assessment of overweight or obese patients, using innovative tools based on 3D body reconstruction and predictive modeling.

**Challenges to Address and Technical Phases**

1. **3D Model Acquisition**

3D images of the body are captured from multiple viewpoints using RGB-D sensors, due to their precision, low cost, and portability. The images are aligned using articulated rigid registration techniques, enabling the construction of a complete body model. The research team has developed advanced RGB-D camera alignment methods, optimizing accuracy under real-world capture conditions [22–24].

2. **4D and Predictive Model Generation**

Starting from 3D models obtained at different stages of the treatment, deformable registration techniques (such as CPD or TPS-RPM) are applied to quantify morphological deformations. These variations are parametrically represented using methods such as *Relative Elemental Growth Rate or GRID*, facilitating temporal analysis of body changes [27–31]. Additionally, a predictive model of body shape and texture is developed, conditioned on dietary-nutritional and psychological variables. This model allows anticipation of the patient's body evolution under different intervention scenarios, moving from a retrospective view to a future projection that can directly influence motivation.

3. **3D and 4D Model Visualization**

The models are processed to generate realistic visualizations compatible with low-cost virtual reality devices. Solid surfaces are reconstructed from point clouds using specific geometric modeling techniques [32, 33]. The team has prior experience in advanced visualization in sectors such as footwear manufacturing and automated visual inspection. Multidimensional model visualization not only provides a clearer understanding of physical changes but also aims to generate a positive emotional impact on the patient. This personalized virtual representation of body evolution serves as a motivational reinforcement to maintain long-term adherence.

4. **Intervention Effect Analysis**

The effect of the system on motivation, treatment adherence, cognitive function, and psychological well-being will be assessed. An intensive intervention based on the Mediterranean Diet combined with 4D VR models will be compared to conventional treatment. Collection of clinical, anthropometric, and psychological data will allow system validation and feed the predictive models. Patient health will be monitored through indicators such as weight, BMI, body fat percentage, adipose tissue distribution, cardiovascular risk indicators, and metabolic syndrome parameters. Additionally, questionnaires assessing emotional, motivational, and cognitive status, as well as body image perception and executive function—which is related to the ability to maintain long-term healthy behaviors—will be included.

**Technical Capacity and Team Experience**

The project is multidisciplinary, with multiple disciplines collaborating to achieve the common goal of improving motivation and long-term adherence to dietary-nutritional treatments. The research team has a strong track record in 3D image capture and processing, RGB-D sensor calibration and registration [22–27], as well as realistic modeling and visualization. The team also includes professionals in nutrition, psychology, and clinical assessment with experience in national and European projects focused on obesity, treatment adherence, and mental health.

**Ethical Considerations**

The study was approved by the Research Ethics Committee of the University of Alicante (code UA-2021-11-18, dated 18/11/2021). Prior to study participation and data collection, all participants provided written informed consent. Data will be handled in accordance with the GDPR and LOPDGDD regulations, with anonymization implemented through unique participant codes.

The following sections describe the study design, selected population, eligibility criteria, sampling strategy, sample size calculation, definition of included variables, measurement instruments, monitoring plan, and analysis strategies, along with potential limitations.

**Study Design**

A prospective longitudinal design with two assessment points was implemented: baseline (pretest) and post-intervention (posttest) after six months of treatment. The study comprised two groups: control and experimental. The control group received nutritional and physical activity education based on recommendations from a nutritionist. The experimental group received a specific, individualized dietary-nutritional intervention program combined with 4D virtual reality. Both groups were assessed for cognitive, clinical, and nutritional outcomes at baseline (pretest) and after six months of intervention (posttest).

To ensure sample representativeness and the generalizability of results, the sample size was calculated using the G*Power 3.1 statistical software. A statistical power of 80%, a medium effect size (0.5), and a significance level ($\alpha$) of 0.05 were established. Under these parameters, at least 35 participants per group were required to carry out the intervention.

**Selected Population**

The sample consisted of a total of 133 Spanish volunteers, both men and women, aged between 22 and 67 years (M = 47.11 years; SD = 9.38). Participants were randomly assigned to one of the two groups (experimental or control).

**Inclusion and Exclusion Criteria**

*Inclusion:* Participants must have a Body Mass Index (BMI) greater than 24.9 (normal weight: 18.5 ≤ BMI < 25; pre-obesity or overweight: 25 ≤ BMI < 30; obesity: BMI ≥ 30), according to the WHO classification (2000); be right-handed; be able to read and write fluently; and have Spanish as their native language.

*Exclusion:* Participants will be excluded if they are currently undergoing or have undergone dietary-nutritional treatment with a nutrition specialist within the past year; have endocrine-metabolic disorders (including thyroid, pituitary, adrenal gland issues, or metabolic syndrome); have a history of neurological disease (e.g., stroke, Parkinson's disease) or traumatic brain injury (with loss of consciousness exceeding 30 minutes); have a history of severe psychopathology according to DSM-IV-TR diagnostic criteria; or are currently receiving psychiatric treatment.

**Description of Variables and Data Collection Procedures**

**1. Personal and Sociodemographic Data:**

- Age, sex, marital status, nationality, city of residence, residential area, geographic region, employment status, current living situation, educational level, monthly income, tobacco use, alcohol consumption, presence of any medical conditions, and history of COVID-19 infection.

These data were collected through a questionnaire administered via Google Forms.

**2. Anthropometric Variables:**

- **Anthropometric measurements:** Weight, height, BMI, body fat percentage, visceral fat percentage, trunk fat percentage, right and left arm fat, right and left leg fat, waist, hip, and wrist circumferences, muscle mass percentage, muscle mass in kilograms, and total body water.

Weight, fat percentage, muscle mass, and total body water were measured using the TANITA MC-780MA P digital scale (TANITA Corporation, Arlington Heights, IL, USA). Height was measured using a portable stadiometer SECA 213 (SECA, Hamburg, Germany). BMI was calculated as weight divided by height squared ($kg/m^2$). Waist, hip, and wrist circumferences were measured with a flexible tape measure with 0.1 cm precision.

**3. Clinical Variables and General Health Status:**

- **Clinical Measures:** Blood glucose (mg/dL), total cholesterol (mg/dL), triglycerides (mg/dL), and blood pressure (systolic and diastolic).

Capillary concentrations of cholesterol, glucose, and triglycerides were assessed using Accutrend® Plus with two drops of blood (15–40 µL) collected from different fingers using a lancet device (Accu-Chek® Softclix® Pro, Roche Diagnostics GmbH, Mannheim, Germany). Blood pressure was measured using an M7 Intelli IT sphygmomanometer (OMRON, M7 Corp., Kyoto, Japan).

**4. Nutritional and Lifestyle Variables:**

**Questionnaires:**

- Adherence to the Mediterranean Diet: Assessed using the PREDIMED questionnaire (Martínez-González et al., 2004).
- Physical Activity: Measured with the International Physical Activity Questionnaire (IPAQ) (Craig et al., 2003), which includes 7 questions on frequency, duration, and intensity (vigorous and moderate) of physical activity over the past 7 days, as well as walking and sedentary time on a workday.
- 24-Hour Dietary Recall: Patient food intake over the previous 24 hours, collected through three 24-hour recalls (two weekdays and one weekend or holiday).
- Food Frequency Questionnaire: Assessed frequency of food consumption (Martín-Moreno et al., 1993), aimed at recording the average number of times a specified amount was consumed throughout the year.

Data were collected through an adapted questionnaire administered via Google Forms.

**5. Psychological Variables**

- **Executive Functions:** This variable was assessed using the CogniFit General Cognitive Assessment Battery (CAB), a computerized neuropsychological test battery commonly used in research protocols for cognitive skills. The test duration ranges from 25 to 45 minutes and evaluates a wide range of cognitive domains, including cognitive flexibility, divided attention, planning, visual perception, auditory perception, spatial perception, contextual memory, short-term visual memory, non-verbal memory, short-term memory, working memory, short-term auditory memory, processing speed, naming, estimation, monitoring, reaction time, visual scanning, recognition, hand-eye coordination, focused attention, and inhibition. Scores range from 0 to 800 points, with higher scores indicating better cognitive performance.

**Questionnaires:**

- Premorbid Intelligence: Assessed using the Word Accentuation Test (TAP) (Del Ser et al., 1997), which estimates premorbid intelligence through the accentuation of 30 words. The number of correct answers corresponds to an estimated premorbid IQ based on WAIS-IV scoring.
- Emotional Eating: Measured with the Emotional Eater Questionnaire (CCE) (Garaulet et al., 2012). Higher scores indicate greater influence of emotions on

food choices and eating habits.

- Prefrontal Symptoms: Assessed using the Prefrontal Symptoms Inventory (ISP-20) (Ruiz et al., 2012); the short version (Pedrero-Pérez et al., 2015) is a self-report questionnaire measuring cognitive, emotional, and behavioral alterations in daily activities.
- Impulsivity: Measured with the Barratt Impulsiveness Scale, BIS-II (Barratt, 1959), comprising 30 items divided into three subscales: cognitive impulsivity (8 items), motor impulsivity (10 items), and non-planning impulsivity (12 items).
- Health-Related Quality of Life: Assessed using the Short Form-12 Health Survey (SF-12) (Ware et al., 1996).
- Depression: Measured using the Beck Depression Inventory (BDI-II) (Beck, Steer & Brown, 1996).
- Life Satisfaction: Measured using the Satisfaction With Life Scale (SWLS) (Diener et al., 1985).

All questionnaire data were collected via Google Forms.

## 6. Technological and Body Image Variables

- **Body Image:** Assessed using the Body Self-Relations Questionnaire (MBSRQ – reduced Spanish version) (Botella et al., 2009). The instrument contains 45 items divided into two distinct parts: one evaluating general body image and another assessing satisfaction with specific body areas.
- **3D and 4D Images:** The 4D model represents morphological changes over time. Using wide-spectrum, low-cost 3D acquisition technologies (RGB-D sensors), a 4D model was constructed as the core of a human body visualization system, enabling accurate and realistic visualization over time. Throughout the intervention, morphological 3D images of participants were obtained, allowing them to observe their evolution through immersive Virtual Reality (VR) (only the experimental group observed these changes).

Morphological 4D images of participants in each session were captured using the 3D machine, composed of RGB-D devices for 3D image acquisition.

All anthropometric and clinical measurements were collected at the ALINUA Nutrition and Food Clinic, certified as a healthcare center affiliated with the Faculty of Health Sciences at the University of Alicante.

All questionnaires and the neuropsychological battery were administered at two time points: at the start of the program (initial session) and after six months of intervention. Anthropometric data and 4D images were also collected at both time points, as well as during individual follow-up sessions conducted to monitor progress and prevent relapses.

**Monitoring Plan:**

Potential adverse effects arising from the use of Virtual Reality (e.g., dizziness, discomfort, anxiety) and the dietary program (e.g., malnutrition, minor side effects) will be monitored. Adverse events will be recorded in a dedicated database and reported to the Ethics Committee if they are serious or unexpected. Participants will also have the right to withdraw from the study at any time without any consequences.

**Data Analysis:**

Data analysis is structured in two main phases, encompassing both the development of the predictive model and its clinical and psychological validation. A mixed strategy of advanced quantitative and computational analysis will be applied.

**Data Preparation and Preprocessing**

- Cleaning of clinical, anthropometric, psychological, and neuropsychological data.
- Standardization and normalization of variables (e.g., assessment scales, physical measurements).
- Coding of categorical variables (e.g., sex, experimental/control group).
- Outlier control and analysis of missing data (intent-to-treat analysis will be applied if missing data exceed 30%).

**Classical Statistical Analysis**

- **Between-group comparisons (control vs. experimental):**
  - t-tests or ANOVA for continuous measures.
  - Chi-square tests for categorical variables.
  - ANCOVA to adjust for covariates (age, sex, baseline BMI).
- **Longitudinal analysis:**
  - Repeated measures models (repeated measures ANOVA or mixed models).

- Study of changes between assessment points (0 and 6 months).

**Multidimensional Predictive Modeling**

- Use of multivariate regression models and machine learning to predict:
  - Body evolution (based on SMPL/STAR models).
  - Clinical parameters and psychological well-being.
  - Levels of adherence and motivation.
- Model training using data from the first period (M9) and validation in the second period.

**Analysis of Predictive Psychological Variables**

- Correlations between cognitive functions and adherence levels.
- Logistic/multiple regression analyses to identify significant predictors of therapeutic success.
- Evaluation of the mediating effect of psychological variables on physical and clinical changes.

**Tools and Software**

- **Statistics:** IBM SPSS Statistics for Windows v.21.0 (IBM Corp, Armonk, NY; 2012), R (latest stable version), and Python 3.11.9 with SciPy and Statsmodels libraries.
- **Machine Learning and Predictive Modeling:** Scikit-learn for classical models and preprocessing. TensorFlow and PyTorch for developing deep learning models and neural networks, including generative networks (GANs) for 3D modeling and multidimensional analysis.
- **Visualization and Clinical Analysis:** Unity 3D for integration and immersive virtual reality visualization, Blender for 3D model manipulation and creation, and internally developed modules for project-specific VR systems.

**Potential Limitations**

- Possible selection bias (motivated volunteers).
- Loss to follow-up in a 6-month intervention.

- Limited generalizability to the Spanish population with specific sociodemographic characteristics.
- Risk of novelty effect with VR (results may reflect the appeal of the technology rather than the actual intervention effect).

## 7. Expected impact

In the ICT field, the project will provide methods and algorithms to advance the analysis and prediction of morphological evolution in relation to the parametric predictive model. Additionally, the challenge of acquisition using the RGB-D multi-camera column system and 3D self-portraits for home implementation introduces the development of new techniques based on sparse-view approaches.

In the Health Sciences, the project aims to evaluate the impact of predictive models on patient motivation and adherence to treatment for obesity and overweight. Special emphasis will be placed on the positive effect of realistic predictive visualization of individual body shape on cognitive functioning and psychological well-being.

Scientific and technical impact will be disseminated through presentations at international conferences (ECCV, CVPR, IJCNN in 2022; IUNS-ICN, ICCV in 2023) and publications in high-impact international journals starting in 2023 (IJCV, TPAMI, Pattern Recognition, ASOC, CVIU, EJCN, IJBNP, and JN). Results will also be shared in open-access repositories such as RUA. Data and results will be managed under privacy regulations (LOPDGDD and ENS) and made publicly available on open servers for use by the scientific community, with participants' consent. Developed methods will be shared on repositories such as Bitbucket. Results will also be published on the Tech4Diet website.

Knowledge transfer plan: The acquisition systems (column and 3D self-portrait), as well as modeling, visualization, and predictive software, will be patented and registered. Initial operations will take place at the designated center, "Aula de Salud." During this period, the feasibility of establishing a Technology-Based Company (EBT) will be assessed.

Social and economic impact is expected to be high, starting at the Aula de Salud and later transferring the technology to healthcare institutions in the province of Alicante. Collaboration has been established with a newly created group at ISABIAL, led by the Head of Endocrinology at the Alicante University General Hospital (HGUA).

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